

The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

Registered at the G.P.O., Adelaide, for transmission by Post as a Periodical

Adelaide

Vol. XV.



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1933

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The authors of papers are responsible for the facts recorded and opinions expressed.

Address of the Section: C/o Royal Society's Rooms, Institute Building, North Terrace, Adelaide.

Published Quarterly

Single Copy—NINEPENCE

Obtainable from Rigby's Book Shop, Grenfell Street.
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Bookings for the Special Excursions (marked with a star on the Programme) should be made with Mr. B. Cotton, the Museum, North Terrace, or with Mr. R. C. Shinkfield, Weather Bureau, West Terrace, Adelaide. In the case of Motor Trips, ticket is to be paid for at time of booking.

EXCURSIONS.

November 11th—Mt. Lofty to Aldgate. Flora. Leader, Mr. A. J. Morison.
November 25th—Outer Harbour. Shells. Leader, Mr. Kimber.
December 2nd—Mr. Burdett's Native Flora at Basket Range. Leader, Chairman.
February 17th—Mylor. Trees and Birds. Leader, Mr. B. B. Beck.

LECTURES AND EVENING MEETINGS.

November 21st—JUBILEE MEETING.

February 20th—Conversazione.

The South Australian Naturalist.

Vol. XV. ADELAIDE, NOVEMBER 30th, 1933. No. 1.

PROCEEDINGS.

JUNE, 1933.

The monthly meeting was held on the 16th June: Chairman, Mr. E. H. Ising.

NOMINATIONS.

Mr. H. Womersley, Museum, Adelaide.
As Honorary Members: Mr. C. O. and Miss J. Chalmers, Macdonald Station, via Alice Springs.

HON. SECRETARY.

Mr. E. V. Dix having found it necessary to resign, was thanked for his services and it was decided to record in the minutes the appreciation of the Section for the work rendered. Miss J. M. Murray was appointed to the position.

BUSINESS.

Mr. A. D. Service having been promoted to Brisbane, he and his wife left during the month to reside in Queensland. The Royal Society of Tasmania wrote asking for our support in the effort to retain the reserve of Cat Island, Bass Strait, for gannets. It was decided to support the Society.

FLOWER SHOW.

Mr. E. H. Ising, having stated that it was impossible for him to undertake the Secretarial work this year, asked for members to act for certain sections as Convenors.

LECTURE.

The Chairman gave a welcome to various visitors represented by members of the Institute of Public Administration, of the S.A. Angling and Fish Protection Society, of the public, and new members. Mr. Fred J. Nottage then gave a lantern lecture entitled, "Big Game Hunting in Central Africa."

JULY, 1933.

The Chairman, Mr. E. H. Ising, presided.

NOMINATIONS.

1. Mr. J. D. Somerville, 279 Goodwood Road, Kings Park.
2. Mr. M. W. Mules, Box 40, Woodside.
3. Miss L. Morgan, 13 First Avenue, Joslin.
4. Miss A. Baxter, Myponga.

ELECTION:

Mr. H. Womersley, A.L.S., F.E.S., Entomologist, Museum, Adelaide.

LECTURE:

The Chairman welcomed members of the Institute of Public Administration, the S.A. Anglers and Fish Protection Association, and Miss Rosa Fiveash, the celebrated Adelaide wild flower artist and others; he then introduced Mr. H. H. Finlayson, Hon. Curator of Mammals, Adelaide Museum, who gave a lantern lecture on "Ayers' Rock and Mt. Olga, Central Australia." It was illustrated by many excellent photographs.

EXHIBITS:

Mr. A. J. Wiley, several examples of turned native timbers; Miss Correll, paintings of orchids, etc.

AUGUST, 1933.

The Chairman, Mr. E. H. Ising, presided.

ELECTIONS:

(1) Mr. J. D. Somerville; (2) Mr. M. W. Mules; (3) Miss L. Morgan; (4) Miss A. Baxter

INDEX TO "S.A. NATURALIST."

The Chairman presented an Index of Volumes I to X.

ANNUAL REPORTS:

The following were presented:—The Secretary; Fauna and Flora Protection Committee; The Malacological Society; The Treasurer.

ELECTION OF OFFICERS:

Chairman: Rev. H. A. Gunter.

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Editors: Messrs. W. Ham and B. C. Cotton.

Fauna and Flora Protection Committee: Prof. J. B. Cleland, Dr. C. Fenner, Lt.-Col. D. Fulton, Capt. S. A. White, Messrs E. Ashby, W. H. Selway, J. M. Black, F. Angel, B. B. Beck, W. C. Hackett, J. N. McGilp, H. M. Hale, J. R. Royle and H. H. Finlayson.

LECTURETTES:

The following gave short talks:—Mr. H. Womersley on "Springtails;" Mr. A. J. Wiley on "Some Native Timbers;" Mr. R. C. Shinkfield on "The Wet Bulb Thermometer" and Mr. H. Goldsack on "Some S.A. Orchids."

JUBILEE, 1933.

The date of the Jubilee Celebration was left to the Committee to decide.

SEPTEMBER, 1933.

The Chairman, Rev. H. A. Gunter, presided.

NOMINATIONS:

1. Miss N. H. Woods, M.A., High School, Mt. Barker.
2. Mr. E. T. Wheare, Ardrossan.

LECTURE:

In the absence of Mr. E. H. Ising, through illness, Capt. S. A. White gave a lantern lecture on "Birds and their Usefulness in regard to the State."

OCTOBER, 1933.

The Chairman, Rev. H. A. Gunter, presided.

NOMINATIONS:

1. Mr. J. Gilbert, Junction Road, Rosewater.
2. Mrs. J. M. Moore, 1 Charles Street, Norwood.
3. Mr. A. R. Hilton, Agricultural High School, Fullarton Road, Mitcham.
4. Mr. N. B. Tindale, Ethnologist, Museum, Adelaide.

ELECTIONS:

Miss N. H. Woods and Mr. E. H. Wheare.

REVIEW OF WILD FLOWER SHOW:

A number of suggestions were recorded with regard to improvements for future Shows.

LECTURETTE:

The Chairman gave a very interesting account of a visit to the Grampians, Western Victoria.

WILD FLOWER SHOW OCTOBER 13 and 14, 1933.

The Show took place in the Town Hall, kindly lent by the Lord Mayor for the occasion. On Friday evening Prof. Sir Douglas Mawson, who was accompanied by Lady Mawson, formally opened the Show and, in the course of his speech, said:

"Leave Nature alone and she will beautify the land with trees and flowers. Our own lovely Mt. Lofty Ranges are thus blest. Trees and natural vegetation are a call to the soul of man: there is some bond between them—perhaps a primal urge arising from primitive man's close association with the forest. But trees and flowers are in themselves objects of wonder and admiration. They may on the one hand be majestic and superb, or on the other, delicate in form, charming in colour, and exquisite in design. They reflect in a subtle way the genius of the Creator.

"Nature has done wonders for us in the Mt. Lofty Ranges, where populated, well-watered highlands with adversity of climates extend to within the suburban area. It is a unique heritage and we should be alive to the boon it offers, if we develop this inheritance along right lines. All the elements are present for a congenial abode for man—a pleasant climate, plentiful rainfall, suitable storage basins for water-conservation, abundance of

native vegetation and requisite conditions for the introduction of a wide range of exotics. This region is capable of being developed with the attainment of both spiritual and financial profit.

"But this excellent raw material which nature tenders is not sufficiently appreciated by a large section of our people, for in the settlement of our countryside we find evidence of thoughtlessness and needless destruction of the beautifying elements and the introduction of painful features. Thus we may deplore the absence of the general adoption of a sympathetic treatment for tree culture along the roads and we may fittingly execrate the vandals who desecrate the country roads with advertisements, particularly where they affront nature's handiwork by placarding road-side trees.

"First stages in construction are always ugly, consequently in carving a new order of things out of our raw material, we cannot expect the perfection of the long-populated regions of the old world. But we will do well in revising nature as we find it in Australia, to emulate it in restoring beauty and harmony wherever possible. Tracts of native bush and fields of wild flowers in our Adelaide Hills will be an accordant note.

"This exhibition of wild flowers brings together those who appreciate beauty and are in tune with nature, and it is you who will ever be a strength and shield in the maintenance of all that is lovely in our country-side."

The weather was so cool that the flowers kept their condition beautifully and presented a most interesting appearance. Twenty-four competed in the Schools' Section, sending a very fine variety of the State's native flowers. The awards went to the following schools, viz:—Myponga, first; Echunga, second; Yeelanna, third; Keith, fourth; Basket Range, fifth; and Naracoorte, sixth.

Interstate flowers were sent by kindred Societies in Queensland, New South Wales (Sydney and Broken Hill), Victoria and West Australia. Fine collections of Australian flowers grown in our hills were made by Mr. Burdett of Basket Range and by Mr. Ashby, of "Wittunga," Blackwood.

The display of Shells by the Malacological Society was very fine and the collection was made more interesting by the many talks and explanations given by Mr. Godfrey, Mr. Kimber, and other members. Two of the evening lecturettes on allied subjects were given by Messrs. Cotton and Kimber.

The Aquarium Society, as usual, made a most interesting exhibit of many varieties of fish, newts, etc., in well-lighted aquaria. The Museum staged a novel exhibit of native weapons and ceremonial articles from Arnhem Land and Groote Eylandt, with casts of natives and a bust of the well-known David Unaipon. The Entomologist, Mr. Womersley, showed diagrams, models and specimens of injurious insects. In this connection, Mr. N. Tindale's lecture on the life of the Northern natives, illustrated by a fine series of slides and musical selections on the native "didgeridoo", was greatly appreciated. The Director of the Museum, Mr. H. M. Hale's, illustrated lecture on some of the Crustaceans also proved of great interest. The Section is indebted to Messrs. Laubman and Pank for the loan of a first-class Episcopa which greatly added to the effectiveness of the four lectureries.

Mr. Machell of the Teachers' College, made a fine exhibit of Pond Life which proved a great attraction. The Waite Institute showed interesting diagrams and graphs and a collection of fodder plants, while the Principal of the Roseworthy Agricultural College showed a fine collection. Messrs. G. and B. Beck showed the unusual fruits of several varieties of Eucalypts grown on the Adelaide plains.

The picture competition resulted in a fair number of entries, the works exhibited being very creditable.

The massed effects, arranged by Mrs. Cordon, were a striking feature in the front of the stage representing a mossy glade of the woods, pools reflecting the beauty of the various wild flowers with the Waratahs dominating the scene. Prof. Cleland exhibited a fine collection of ephemeral plants growing in small tins, as well as bacterial and other exhibits. Dr. Pulleine showed succulent plants from South America and South African deserts, comprising various bizarre forms of cacti and Euphorbias.

Two tables of named wild flowers and a third table with named orchids proved of great interest. The Department of Agriculture showed a fine exhibit of noxious weeds.

In the Water Color Designs, first prize was gained by Miss Winnie Burrow of Norwood Central School, and second by Miss Lois Boon, of the S.A. School of Arts and Crafts. In the plant

studies, the first prize was awarded to a study of *Tetrotheca*, kangaroo paws, etc., by Miss Maisie McNicol of Norwood Central School and the second to Miss Edith Baglin also the Norwood Central School.

In the Painting for Amateurs, the first and second prizes were awarded to the very meritorious work of Miss M. Ali of the S.A. School of Arts and Crafts. Several works were shown not for competition, including W.A. Insects by Miss Baesejous, and W.A. Wild Flowers by Miss Crouch.

Mr. Wiley showed many beautiful articles turned from native timbers, mulga, she-oak, etc., and a case of minerals. Several cases of minerals were shown by Mr. S. E. Thomas as well as specimens from the Mines Department. Mr. Thomas also gave instructive talks on the minerals shown, as did Mr. Scotland with his radium ores from Mt. Painter. Lakes Entrance Oil, raw and refined, were shown and explained. Messrs. Faulding showed the narrow-leaved mallee (*Eucalyptus cneorifolia*) of Kangaroo Island and the raw and refined oil obtained by its distillation.

Members, as in former years, worked enthusiastically to make the Show a success. The takings were just over £68, including a donation of 10/ from Mrs. V. Petherick, Naracoorte. The expenses are estimated at £49.

AN AMERICAN FRESH-WATER SNAIL FROM THE RIVER MURRAY AT BLANCHETOWN.

By BERNARD C. COTTON.

At a meeting of the Malacological Society held on April 3rd, 1933, Mrs. L. A. Elliott showed some specimens of a fresh-water snail taken by her at Blanchetown. They were obviously quite distinct from any Australian form, and proved to be typical *Planorbis campanulatus* Say, a fresh-water snail originally recorded from Newport, Iowa, U.S.A., with a distribution from New England to Minnesota. They may be described as follows:—



Shell spirally, sinistrally, flatly coiled, finely obliquely ridged; whorls six, obtusely subcarinate above and below, rapidly increasing, outer one large, rounded, contracted towards the aperture, where it is finally expanded and ear-shaped; spire slightly depressed, umbilicus deep. Measurements—Height 6, diam. 12 mm.

The species is well established at Blanchetown, though the mode of introduction is somewhat a mystery.

In reply to a letter sent to the water works department, the Engineer in Chief writes:—

"The Senior Resident Engineer, Mr. Oliver . . . reported that the shells referred to were found at approximately half a mile upstream, where the American machinery, purchased for lock construction, was unloaded. This place is, however, a landing place for farm machinery and windmills of American manufacture and it is possible, in this way, some mud containing embryo shells was brought from America."

In a later letter, talking of the imported American machinery, he states: "between 20 and 30 years ago a quantity of it was bought by local farmers."

It is satisfactory to know that the importation is apparently harmless, its life history and habits being similar to those of the few indigenous fresh water snails found in the Murray.

This is the first record of a fresh-water snail being imported into South Australia, and probably, Australia.

LIST OF PLANTS OCCURRING BETWEEN OUTER HARBOUR AND SELICK'S BEACH.

By J. B. CLELAND, M.D.

[In identifying these plants much help has been received from
Mr. J. M. Black, Dr. R. S. Rogers and Miss C. Eardley].

An Asterisk (*) indicates an Introduced Species.

- FILICALES.**—*Cheilanthes tenuifolia* Swartz. Sellick's scrub.
Pteridium aquilinum (L.) Kuhn. Sellick's scrub. *Pleuro-
sorus rutifolius* (R.Br.) Fée, rocks near creek at Hallett's
Cove.
- PINACEAE.**—*Callitris propinqua* R.Br., Pinery.
- TYPHACEAE.**—*Typha angustifolia* L., Bulrush, Fulham, Field
R. (near Hallett's Cove), Pedlar's Creek.
- POTAMOGETONACEAE.**—*Cymodocea antarctica* (Labill.)
Endl., in the sea. *C. Griffithii* J. M. Black, Henley Beach
(in Black's Flora). *Posidonia australis*, Hook. f., many
flowers washed up on October 31, 1928, after a heavy gale
at Christie's Beach; many fruits washed ashore, Brighton,
December 26. *Potamogeton crispus* L., Curly Pondweed,
Breakaway Creek at Fulham. *Ruppia maritima* L., Grange.
- SCHEUCHZERIACEAE.**—*Triglochin calcitrapa* Hook., S. of
Hallett's Cove. *T. mucronata* R.Br., Port River near the
Pinery. *T. procera* R.Br., Fulham, Field R. (Hallett's Cove).
- GRAMINEAE.**—*Imperata cylindrica* (L.) Beauv., Clady Grass,
Sellick's Beach. *Roetboellia compressa* L.f., Mat Grass, near
Glenelg. *Themeda triandra* Forsk., Kangaroo Grass, cliffs
near Aldinga. *Neurachne alopecuroides* R.Br., coast cliffs.
Paspalum distichum L., Fulham. *Panicum effusum* R.Br.,
Pinery, Nov. **Stenotaphrum dimidiatum* (L.) Brongn., Buf-
falo Grass, Ethelton. *Spinifex hirsutus* Labill., sandhills.
**Ehrharta longiflora* Sm., Pinery, Oct. **Phalaris minor* Retz.
Stipa elegantissima Labill., Pinery (Grange); coast cliffs. *S.*
incurva Hughes, Hallett's Cove. *S. Drummondii* Steud. (*S.*
horrifolia J. M. Black), Hallett's Cove, cliffs at Port Noarlun-
ga, scrub south of Hallett's Cove (a very hairy species). *S.*
elator Hughes, Brighton. *S. Blackii* C. E. Hubbard (*S. pubes-
cens* R.Br. var. *comosa* J. M. Black), Marino in Black's Flora.
S. aristiglumis F.v.M. Port Noarlunga. † *Oryzopsis miliacea*
(L.) Aschers. et Schweinf., Many-flowered Millet-grass,
Brighton, Fulham, Outer Harbour. *Sporobolus virginicus*

(L.) Kunth., Outer Harbour, near Fulham. **Polypogon monspeliensis* Desf., Beard-grass, Grange, Fulham. **Agrostis alba* L., Creeping Bent-grass, Fulham. *Calamagrostis filiformis* (Forst.) Pilger, Fulham; var. *Billardieri* Maid. et Bêche, Blown Grass, cliffs south of Hallett's Cove. *Dichetachne crinita* (L.f.) Hook. f., Plume-grass, Grange, south of Hallett's Cove (Nov.). **Ammophila arcuaria* (L.) Link., Marram-grass, planted as a binder on the sandhills. **Lagurus ovatus* L., Hare's-tail Grass, Glenelg. **Aira caryophyllaea* L., Silvery Hairgrass. **A. minuta* L., Pinery. **Avena fatua* L., Wild Oat. *Danthonia penicillata* (Labill.) F.v.M., Wallaby Grass. **Pentaschistis airoides* (Nees) Stapf, Pinery (Oct.) *Pappophorum nigricans* R.Br., Black Heads, near Hallett's Cove. *Phragmites communis* Trin., Common Reed, Reedbeds, Morphet Vale and Pedlar's Creeks. **Koeleria phleoides* Pers. **Briza maxima* L., Large Quaking-grass. **B. minor* L., Lesser Quaking-grass. *Distichlis spicata* (L.) Greene, near salt swamps at Grange and Port Noarlunga. *Poa caespitosa* Forst., sandhills at Grange, Pedlar's Creek, cliffs. **P. annua* L., Annual Meadow-grass. *Glyceria stricta* Hook.f., salt swamp at Outer Harbour, Grange, Port Noarlunga. **Festuca Myuros* L., Rat's-tail Fescue. **F. bromoides* L., Grange. **F. rigida* (L.) Kunth., Hard Fescue. **Bromus villosus* Forsk., Great Brome, Grange. **B. madritensis* L., Madrid Brome, Grange, Noarlunga. **B. unioloides* H.B. et K., Prairie-grass, Fulham. **B. hordeaceus* L., Soft Brome, Grange, Fulham, Noarlunga. **Brachypodium distachyum* R. et S., Aldinga, Hallett's Cove, etc. *Gynodon dactylon* Rich., Couch-grass, Grange, Fulham (with smut). **Lolium temulentum* L., (?) Darnel or Drake, Grange. **L. perenne* L., Rye-grass, Reedbeds. **L. italicum* A. Braun, Grange. **L. subulatum* Vis., Grange. *Lepturus incurvatus* Trin., Grange. **Psilurus aristatus* (L.) Duval-Jouve, near cliffs on south side of Hallett's Cove. *Agropyrum scabrum* (Labill.) Beauv., Grange. **A. repens* (L.) Beauv., English Couch-grass, Reedbeds, (Feb.). **Hordeum murinum* L., Barley-grass, Grange. **H. marinum* With., Sea-Barley, Grange.

CYPERACEAE.—*Cyperus tenellus* L.f., Sellick's scrub. *C. vaginatus* R.Br., Grange, Fulham. *C. rotundus* L., Nut-grass, Torrens at Fulham. *Schoenus apogon* Roem. et Sch., cliffs south of Hallett's Cove. *S. Tepperi* F.v.M., cliffs north and south of Hallett's Cove. *Scirpus cernuus* Vahl., Fulham. *S. antarcticus* L., Grange, Seaton. *S. nodosus* Roub., common on sandhills at Grange, etc. *S. americanus* Pers., Al-

dinga. *S. maritimus* L., Fulham, Pedlar's Creek. *Cladium junceum* R.Br., Grange, Sellick's scrub. *C. filisium* (Labill.) R.Br., near Glenelg, in places on coastal cliffs (Aldinga). *Gahnia lanigera* (R.Br.) Benth., cliffs at Moana. *Lepidosperma gladiatum* Labill., Sword Rush, common on sandhills (Grange, etc.). *L. concavum* R.Br., Pinery, cliffs. *L. carphoides* F.v.M., Sellick's scrub.

CENTROLEPIDACEAE.—*Centrolepis strigosa* (R.Br.) Roem. et Schult., south of Hallett's Cove.

JUNCACEAE.—**Juncus capitatus* Weig., Aldinga. *J. bufonius* L., Toad Rush, Grange, Aldinga. *J. maritimus* Lamk. var. *australiensis* Buch., Field R. (Hallett's Cove). *J. pallidus* R.Br., Pale Rush, Fulham. *J. pauciflorus* R.Br., Grange.

LILIACEAE.—*Dianella revoluta* R.Br., Grange, cliffs. *Burchardia umbellata* R.Br., Sellick's scrub, cliffs. *Lomandra effusa* (Lindl.) Ewart, cliffs. *L. filiformis* (Thunb.) J. Britten, cliffs south of Hallett's Cove. *L. glauca* (R.Br.) Ewart, slightly sweet-scented (Oct.), Grange sandhills, cliffs. *L. juncea* (F.v.M.) Ewart, cliffs. *L. leucocephala* (R.Br.) Ewart, Pinery. *Thysanotus Patersonii* R.Br., Sellick's scrub. *Th. Baueri* R.Br., Pinery. *Chamaescilla corymbosa* (R.Br.) F.v.M., Hallett's Cove (Sept.). *Tricoryne elatior* R.Br., Pinery. *Bulbine bulbosa* (R.Br.) Haw., Pinery, Hallett's Cove. *B. semibarbata* (R.Br.) Haw., cliffs. *Dichopogon strictus* (R.Br.) J. G. Bak., Pinery (Oct.), cliffs. *Xanthorrhoea semiplana* F.v.M. Sellick's scrub. **Asphodelus fistulosus* L., Wild Onion, common.

AMARYLLIDACEAE.—*Calostemma purpureum* R.Br., Marino, Hallett's Cove, Moana cliffs. **Igave americana* L., Fulham.

IRIDACEAE.—**Moraea xerospatha* MacOwan var. *monophylla* Black. **Romulea parviflora* (Salisb.) J. Britten.

ORCHIDACEAE.—Dr. R. S. Rogers has kindly supplied the following two lists of orchids from the area under review or adjacent parts:—

(A.) Outer Harbour to Sellick's Beach:

Thelymitra aristata Lindl. *Thelymitra grandiflora* Fitzg., (cliffs south of Hallett's Cove—J.B.C.). *Microtis porrifolia* Spreng., (Fulham, cliffs south of Hallett's Cove—J.B.C.). *Lyperanthus nigricans* R.Br. *Eriochilus autumnalis* R.Br. *Caladenia leptochila* Fitzg. *C. dilatata* R.Br. *C. deformis* R.Br. *Pterostylis Mitchellii* Lindl., Grange.

(B). South Road to the Sea (including the west side of Myponga):

Thelymitra grandiflora Fitzg. *Th. pauciflora* R.Br. *Th. fusciculuta* R.Br. *Th. aristata* Lindl. *Microtis porrifolia* Spreng. *Prasophyllum fuscum* R.Br. *P. odoratum* Rogers. *Acianthus exsertus* R.Br. *Lyperanthus nigricans* R.Br., (Sellick's scrub—J.B.C.). *Eriochilus autumnalis* R.Br. *Caladenia leptochila* Fitzg. *C. Patersonii* R.Br. *C. dilatata* R.Br. *C. deformis* R.Br. *Diuris pedunculata* R.Br. *D. palustris* Lindl. *D. brevifolia* Rogers. *Pterostylis nana* R.Br. *Pt. pedunculata* R.Br. *Pt. longifolia* R.Br. *Pt. vittata* Lindl. *Pt. barbata* R.Br.

CASUARINACEAE.—*Casuarina stricta* Ait., Pinery, Marino, Hallett's Cove, Sellick's scrub. *C. Muelleriana* Miq., a few shrubs on the cliffs south of Hallett's Cove.

URTICACEAE.—**Urtica urens* L., Small Nettle.

PROTEACEAE.—*Isopogon ceratophyllus* R.Br., Sellick's scrub. *Hakea rugosa* R.Br., cliffs at Marino, Hallett's Cove and south thereof. *Banksia marginata* Cav., Pinery, Sellick's scrub. *Grevillea ilicifolia* R.Br., Holly-leaved Grevillea, Pinery, sandhills near Glenelg. *G. lavandulacea* Schl., cliffs south of Hallett's Cove, Sellick's scrub (Nov.).

SANTALACEAE.—*Exocarpus cupressiformis* Labill., Native Cherry, Sellick's scrub. *E. aphylla* R.Br., Marino cliffs. *Eucarya acuminata* (R.Br.) Spr. et Summ., Quandong or Native Peach, growing in *Acacia armata*, etc., rarely fruiting, Pinery, Hallett's Cove scrub, Sellick's scrub. *Eucarya Murrayana* T. L. Mitch., Bitter Quandong, Sellick's scrub.

LORANTHACEAE.—*Lorathus Exocarpi* Behr., on *Casuarina stricta* and *Eucarya acuminata*, Pinery. *L. miraculosus* Miq. var. *Melaleuca* Tate on *Melaleuca pubescens*, Hallett's Cove scrub (Nov.).

POLYGONACEAE.—**Rumex pulcher* L., Fiddle Dock, Fulham. *R. Brownii* Campd., Fulham, Grange. **R. conglomeratus* Murray, Clustered Dock, Fulham. **R. crispus* L., Curled Dock, Fulham. **Emex australis* Steinh., Grange, Port Noarlunga. **Polygonum aviculare* L., Wireweed. *P. serrulatum* Lag., Torrens at Fulham. *P. lapathifolium* L., Reedbeds (in Black's Flora). *Muehlenbeckia adpressa* (Labill.) Meisn., on sandhills, Grange etc.; on coast cliffs. *M. Cunninghamii* (Meisn.) F.v.M., Lignum, Pedlar's Creek.

CHENOPODIACEAE.—*Rhagodia baccata* (Labill.) Moq., Coastal Saltbush, Grange, Fulham Park. *Rh. nu'ans*, R.Br., Pinery, Fulham near Glenelg, south of Hallett's Cove. *Chenopodium carinatum* R.Br., Keeled Goosefoot, Port Noarlunga. **Ch. anthelminticum* L., Port Adelaide and Semaphore (Black's Flora). **Ch. ambrosioides* L., Mexican Tea, Reedbeds. **Ch. album* L., White Goosefoot, Fulham. **Ch. murale* L., Nettle-leaved Goosefoot, Fulham. *Ch. ambiguum* R.Br., Grange, Reedbeds. **Beta vulgaris* L., Common Beet, Fulham. *Atriplex paludosum* R.Br., Marsh Saltbush, mouth of the Onkaparinga, cliffs at Pedlar's Beach. *A. cinereum* Poir., Grey Saltbush, near the shore, Grange. *A. Muelleri* Benth., Grange, Lockleys, Ethelton. *Bassia uniflora* (R.Br.) F.v.M., Pinery, near Marino, Hallett's Cove, Port Noarlunga cliffs. *Kochia oppositifolia* F.v.M., in saltmarshes at mouths of Onkaparinga and Patawolong. *K. excavata* J. M. Black, cliffs at Pedlar's Beach. *K. crassiloba* R. H. Anderson F.v.M., (*Euchylaena villosa*), cliffs south of Hallett's Cove, Aldinga. *Salsola Kali* L., Rolly Poly, Buck-bush, Grange, Hallett's Cove, Pedlar's Creek. *Suaeda australis* (R.Br.) Moq., sandhills at Grange, etc. *Euchylaena tomentosa* R.Br., Ruby Saltbush, Grange, Lockleys, Port Noarlunga, Aldinga. *Threlkeldia diffusa* R.Br., Grange. *Arthrocnemum halocnemoides* Nees., Grange (in flower, Nov.). *A. halocnemoides* var. *pergranulatum* J. M. Black. *A. leios-tachyum* (Benth.) Paulsen, Grange. *A. arbuscula* (R.Br.) Moq., Port Adelaide River. *Salicornia pachystachya* J. M. Black, Patawolong.

NOTICE!

As the Society intends to publish a MEMBERSHIP LIST in the S.A. Naturalist, will Members kindly write to the Secretary or Treasurer as soon as possible, giving—

1. Full Name and Address;
 2. Date of Election to Society;
 3. Branch of Natural History in which they are interested.
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SOUTH AUSTRALIAN SHELLS.

(Including descriptions of New Genera and Species).

(By BERNARD C. COTTON & F. K. GODFREY).

PART IX.

HALIOTIDAE.

"Sea-ears," "Ear-shells," "Mutton-fish." Shell nacreous, ear-shaped, spiral, the spire small, body whorl very large and depressed, having a row of round or oval holes along the left side; aperture very large, occupying nearly all the lower face; columella (properly speaking) absent, the spire being open in the middle, seen from below; columellar margin produced into a flattened spiral plate; interior pearly, iridescent, with a large central muscular scar. No operculum. Distribution—Tropical and temperate; west coast of Europe, Mediterranean, east coast of Africa, Cape of Good Hope, Indian and Pacific Oceans, China, Japan, California, Australia, Tasmania and New Zealand. Fossil—Cretaceous. Animal with a strong fleshy foot about as long as the shell or perhaps a little longer posteriorly, its upper surface granose; head with a short thick proboscis ending distally in a rounded disc, in its centre the mouth, longitudinally oval; a frontal veil, somewhat lobed but not fringed, connects the short eye stalks which lie just above and outside of the tapering tentacles; a fleshy and prominent epipodial ridge surrounds the foot, its border tuberculate and fringed with short cirri; in front this epipodial ridge terminates just under the tentacles; behind it is interrupted by an oval rugose tract of the integument (the operculigerous lobe) indicating the position of the absent operculum; mantle slit at the position of the row of holes, the slit extending as far back as the last open hole, which is occupied by the prolonged free anus; gills long, one on each side of the slit, each composed of two series of lamellae united by a central rachis.

The Sea-ear was called "Venus's ear" by the Eolians; it is the "Mother of Pearl" or "Norman Shell" of old English writers; in the Channel Islands it is "Ormer" (contracted from oreille-de-mer); French names are "Ormier" and "Silieux" (six yeux, six eyes); in California they are known as "Abalones," a local name of uncertain etymology; "Awabi" is the Japanese name. Sea-ears are found under stones or in secluded places among rocks when the tide is low, attached like limpets; *H. cyclobates* is usually found on *Pinnae* (razor-fish). They are chiefly plant feeders, but diatoms in considerable quantities have been detected in their stomachs together with the spicula of sponges. Sexes distinct. It is interesting to watch the mode of locomotion of a

Haliotis; when placed on a smooth rock it strides on apace, with body slightly swaying from side to side, evidently exerting great muscular force. Mutton-fish are eaten in many countries. Should the animal be fried, it must be beaten for some time, like a rough beef-steak; if it is scalloped, it must first be well scrubbed, then allowed to simmer for several hours, and then can be scalloped like an oyster. Many consider "abalone soup" as fit for the table of the most fastidious. They were a favourite article of diet with our natives.

The inside of the shell displays all the colours in the rainbow. Sir David Brewster explained this iridescence as due to minute striae or grooves on the surface of the nacre, which alternate with others of animal membrane. Stewart opines that the colour is produced by the nature of the laminae, which decompose the light in consequence of the interference caused by the reflection from the two sides of each film, as may be seen in soap bubbles; he further believes that the nacreous or inner layer is only a modification of the previously formed prismatic layer, each layer being composed of particles or prisms mostly representing an hexagonal outline. The shells are much used for the manufacture of pearl buttons, buckles, and inlaying. If the rough covering of the exterior be removed, the shell beneath is seen to be quite as beautiful as that of the interior. In New Zealand, seals eat species of *Haliotis* apparently without crushing the shell with the teeth, and when the animal has been digested the empty shells are disgorged; the shells lying about on the beach are pearly outside, having lost the periostracum through the action of the acid gastric juice in the seal's stomach. Fine green pearls are sometimes found under the mantle of the animal.

The centre of distribution of Recent species is in the Australian and adjacent seas; here are found the greatest number of species and greatest diversity of forms. The largest species inhabit the west coast of North America. Not one species is found on the east coast of North or South America. The South Australian beach collector will probably find *H. nuxiosa*, *H. conicopora* and *H. cyclobates* before the others, though *H. roei* and *H. albicans* are common on Yorke Peninsula.

Haliotis Linné 1758. "Sea-ear, Ear-shell, Mutton-fish." From *halios* marine, and *ous* (*otos*) an ear. Characters are those of the family. Type—*H. asinina* Linné (Queensland). The principal characters for distinguishing the species are the outline of the shell, which is either equally curved on the two sides or straighter on the right margin; the convexity of the back, which may be carinated or rounded at the row of holes; the sculpture;

the position of the spire; the colour of the inside; smoothness or roughness of the muscle-scar; width and slope of the columellar plate; and within rather wide limits the number of open holes (Pilsbry). It is convenient to divide the numerous species of *Haliotis* into groups and for our Southern Australian Mutton-fish we suggest the following, which may, if desired, be considered as subgenera.

Schismotis Gray 1856 (Subgenus). Oval, evenly convex, the two sides equally curved; almost smooth, having obsolete fine spiral striae; not carinated at the row of holes; cavity of spire large, not concealed; nacre silvery; muscle-scar not distinct; holes very small, not tubular. Type—*H. excisa* Gray (a deformed *albicans*). *H. albicans* Quoy & Gaimard, belongs here.

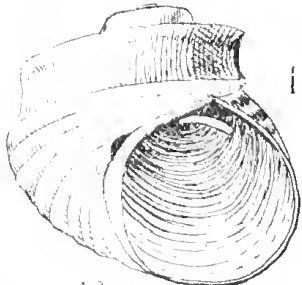
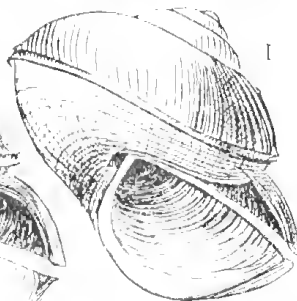
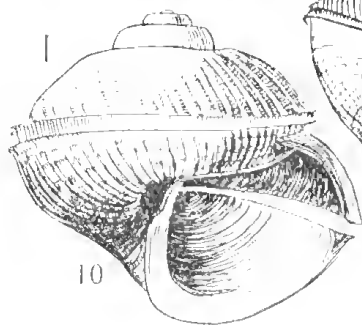
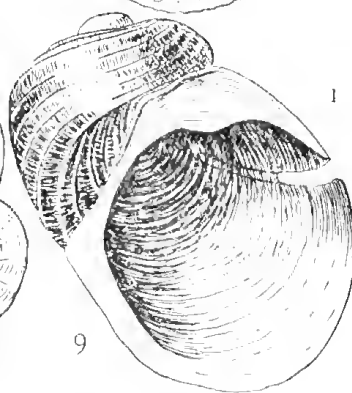
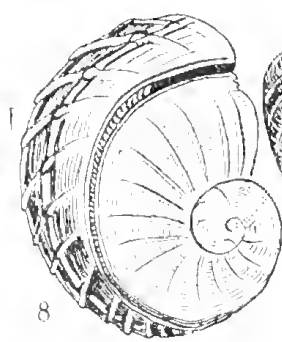
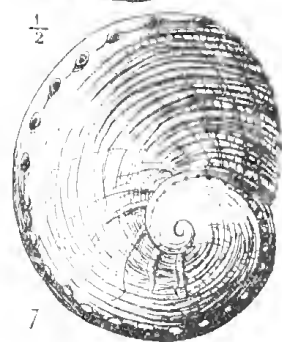
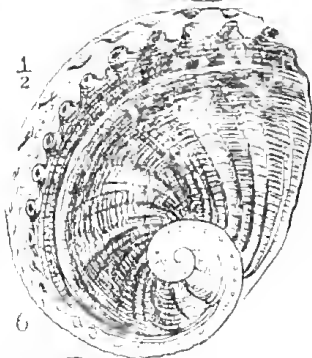
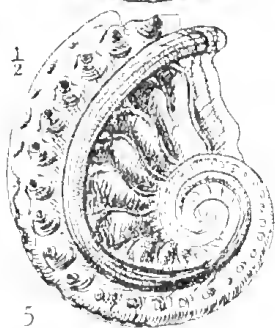
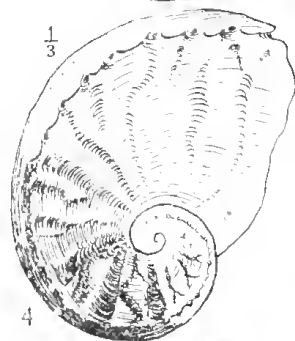
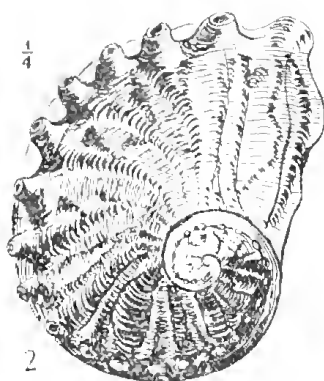
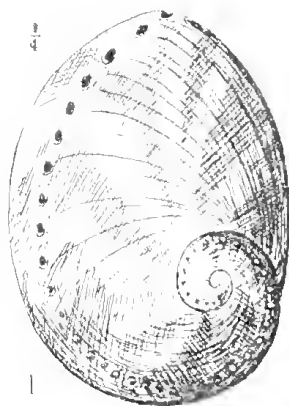
Notohaliotis (subgen. nov.) Shell rounded, flattened, spire large; spiral striae (sometimes obsolete) and usually radiating waves; keel at the row of holes; inside silvery. Type—*H. naevosa* Martyn. We also add *H. roei* Gray and *H. conicopora* Peron.

Neohaliotis (subgen. nov.) Upper surface closely spirally striated; spiral rib strong, rounded, inside the row of holes; raised lamellae between spire and inner spiral rib. Type—*H. scalaris* Leach. *H. emmae* Gray, is related.

Exohaliotis (subgen. nov.) Shell subcircular, very convex, spire subcentral and comparatively extremely elevated; spirally lirate and radiately folded. Type—*H. cyclobates* Peron.

H. albicans Quoy & Gaimard 1834. Pl. 1, fig. 1. (= *Schismotis excisa* Gray, a monstrosity. Iredale considers the name to be *H. laevigata* Donovan 1808, based only on a drawing). "The Whitened Haliotis." Large, oval, distance of protoconch from margin one-sixth to one-eighth the length of shell; orange or orange-scarlet, radiately striped with continuous white flames; nearly smooth but with obsolete spiral lirae; perforations very small. Length 174, breadth 129, height 40 mm. A specimen in Mr. W. J. Kimber's collection measures 196 x 157 x 60 mm. Along the coast of South Australia from Glenelg River to St. Francis Island, not uncommon, cast up after storms with kelp attached. Also Western Australia (King George Sound. Type locality—upon rocks at the entrance). Right and left margins about equally curved; back convex, rounded, not angulated at the row of holes; rather thin; colouration consists of continuous oblique stripes of scarlet and whitish; surface sculptured with nearly obsolete spiral threads and cords; spire moderately elevated, whorls about two-and-a-half; inside silvery, nacre almost smooth, but showing traces of spiral sulci, and very minutely





EXPLANATION OF PLATE.

PLATE I.

- Fig. 1—*Haliotis albicans* Quoy & Gaimard.
Fig. 2—*Haliotis conicopora* Peron.
Fig. 3—*Haliotis roei* Gray.
Fig. 4—*Haliotis naxiosa* Martyn.
Fig. 5—*Haliotis scalaris* Leach.
Fig. 6—*Haliotis emmae* Gray.
Fig. 7—*Haliotis cyclobates* Peron.
Fig. 8—*Scissurella ornata* May.
Fig. 9—*Scissurona remota* Iredale.
Fig. 10—*Schizotrochus australis* Hedley.
Fig. 11—*Schizotrochus gunteri* sp. nov.
Fig. 12—*Schismope atkinsoni* Tenison-Woods.



wrinkled; columellar plate rather wide, sloping inward, flattened, obliquely truncated at base; cavity of spire large: rather shallow; perforations unusually small, their borders not raised outside. *H. albicans* is our largest species and appears to inhabit deeper waters than most of our other species. It is distinguished by the delicate rayed style of colouring, the more than usually small perforations, and the minute wavy pattern on the silvery interior. Specimens taken in Gulf St. Vincent are usually white, but those taken on Yorke Peninsula have the striped colouration.

H. naevosa Martyn 1784. Pl. 1, fig. 4. (= *H. clathrata* Reeve: = *H. naevosum improbulum* Iredale 1924). "The Warty *Haliotis*." Rather large, rounded-oval, much depressed, distance of protoconch from margin one-fifth length of shell; spiral cords, fine, cut by close, minute, growth lines, and having radiating waves or folds above; a slight angle at the row of holes, below the angle broadly excavated and then keeled; holes about six, elevated, circular. Length 120, breadth 90, height 28 mm. Common, on rocks at low tide, all along the South Australian coast from the Glenelg River to St. Francis Island. Not recorded from Western Australia. (Type locality—New South Wales). This is one of our most common mutton-fish, its outline is sub-orbicular, much depressed: solid but not thick; either dark red with few radiating angular white patches, or dull red and green, streaked and mottled; the spiral cords are either nearly equal, or have slightly larger ones at wide intervals; the cords are decussated by close growth striae; whorls about three; columellar plate broad, flat, obliquely truncated at the base; inside corrugated like the outer surface, silvery, very brilliantly iridescent, the reflections chiefly sea-green and red; cavity of spire wide, open, but shallow.

H. roei Gray 1827. Pl. 1, fig. 3. (= *H. scabricosta* Menke 1843: not *H. rugosa-plicata* Chemnitz). Short-oval, protoconch from nearest margin about one-fifth the length of shell; scarlet-red, more or less marbled with olive-green, with broad white rays; spiral cords, strong, unequal crossed by radiating folds; open holes usually eight, nearly circular, rather small. Length 75, breadth 58, height 23 mm. Not uncommon at Corny Point, (Yorke Peninsula) but rarer at other stations, Guichen Bay, Encounter Bay, Port Willunga, Edithburgh, Arno Bay, St. Francis Island, Beards Bay. This is by much the most common *Haliotis* in Western Australia, where it may be 100 x 82 mm; it appears to have come around from the west along the southern coast of Australia, and reached Guichen Bay (Verco). (Type locality

not given). Menke described *scabricosta* from Mistaken Island, in King George Sound. The right side of *reoi* is straighter than the rounded left margin, and the back depressed; spiral riblets numerous, unequal, separated by deeply cut grooves, their summits cut by fine radiating striae, and further rendered uneven by more or less developed folds radiating from the suture; spire rather elevated; columellar plate narrow, obliquely truncated at base; inside silvery, very iridescent, with pink, green and steel blue reflections; columellar plate narrow, obliquely truncated at its base; perforations a little raised, numerous. The orbicular form, and knotted spiral cords separated by deep grooves are characteristic; the columella is rather narrower than usual.

H. conicopora Peron 1816. Pl. 1, fig. 2. (= *H. tubifera* Lamarck 1843: = *H. cunninghami* Gray: = *H. granti* Pritchard & Gatliff 1902). "The Conical-tubed *Haliotis*." Very large, rounded-oval, flattened and disc-shaped; distance of protoconch from margin about one-fourth the length of shell. Length 175, breadth 135, height 35 mm. Not uncommon, on rocks just beyond low tide mark, from Glenelg River to Yorke Peninsula. Not recorded from Western Australia. Recorded from Victoria. (Type locality—Kangaroo Island, South Australia). The outline is rounder than *H. naevosa* Martyn, and flatter; right side less curved than the left; the tube-like perforations stand upon a strong keel which sometimes makes the dorsum appear concave; colour dull red, with obliquely radiating revolving flames of whitish-yellow on the earlier part of the body whorl; it may be reddish-brown, variegated with green and darker brown; finely spirally striated near the apex, but later this sculpture gives place to coarse wrinkles of growth; there are also low radiating waves or folds in places; spire is not much elevated; inside is light, very iridescent, red and silver predominating; columellar ledge or plate flat, broad; cavity of spire large, very broad, shallow; open holes variable in number, from seven in young specimens to four in senile individuals. Verco considers it open to question whether this is not really a variant of *H. naevosa* Martyn, as although many examples can be easily distributed in their typical species, others cannot be so readily named.

H. scalaris Leach 1814. Pl. 1, fig. 5. (= *H. tricoloris* Lamarck 1822: not *H. rubicundus* Montfort, which is not an Australian Shell). Rounded-oval, depressed; reddish or variegated olive and green; with a strong spiral rib on each side of the row of holes, and prominent elevated radiating lamellae around the spire; open holes, five to six. Length 75, breadth 53 mm. In

South Australia it is not uncommonly reported from Yorke Peninsula, and to the westward, but is elsewhere rare. Also Western Australia—Esperance, Albany, Ellensbrook, Bunbury, Rottnest Island, where it is less common than *H. roei* Gray, but yet not rare, measuring up to 115 x 92 mm. *H. scalaris* is irregularly oval, depressed, rather thin; with a strong rounded ridge inside of the row of elevated tubular holes, and a smaller, nodose ridge outside of it; above finely striated spirally, and with coarse raised lamellae between the spire and the inner spiral rib; columellar plate narrow; inside silvery and very iridescent, with excavations corresponding to the elevations of the outer surface; open holes five or six. There appears to be no doubt of the identity of South Australian examples, but in Western Australia the sculpture becomes more strongly pronounced, the spiral rib very prominent, the axial lamellae higher and more vertical, and the holes more tubiform.

H. emmae Gray 1846. Pl. 1, fig. 6. Rounded, ovate-depressed, having a low convexity (scarcely a rib) on the upper surface parallel with the row of holes, and numerous lamellae radiating from the spire; sculptured throughout with fine spiral cords; open holes six. Length 47, breadth 34, height 10 mm. Larger specimen 80 x 70 x 20 mm. South Australia, Edithburgh, St. Francis Island, Point Sinclair, Glenelg River, Kingston, Guichen Bay. (Type locality—Australia). The species is short oval, right margin straighter than the left; colour orange-red, with wide rays of lighter; outside of the row of holes there are numerous descending stripes alternately darker and lighter; upper surface has a low wide spiral rib with oblique undulations or folds upon it which take the direction of tangents from the spire; between this and the spire there are numerous radiating raised lamellae-like pinched-up folds taking the direction of growth-striae; entire surface has acute growth striae, appearing as little scales on the fine rounded spiral cords; there is a channel outside of the row of holes; inside silvery iridescent; columellar shelf narrow, flat; perforations low-tubular. Agrees with *H. scalaris* Leach, in having radiating lamellae or folds.

H. cyclobates Peron 1816. Pl. 1, fig. 7. (= *H. excavata* Lamarck 1822). "The Round-back Haliotis." Nearly circular, very convex; spire decidedly elevated, somewhat turbinate, protoconch distant from margin about one-third or one-fourth the greatest diameter of the shell; colour consists of broad radiating patches, or oblique stripes, of chestnut, green, and flesh colour

or whitish; surface covered with close spiral cords and threads which are somewhat granose; numerous folds radiate from the suture, but not long enough to reach the periphery; whorls about three, rounded, convex above; last whorl with a blunt keel at the row of holes, and a narrowed, more acute keel a short distance below it, the space between being a little concave; holes about five, open, oval, their edges only a trifle raised; columellar plate flat, not truncate below, strongly sloping inward; inside silvery with red and green reflections, muscle impression not distinct. Length 68, width 56, height 26 mm. Rather common, from low water to 15 fathoms, on rocks and *Pinnæ* (razor-fish). Gulf St. Vincent, Kangaroo Island, Spencer Gulf and westward to Streaky Bay and Murat Bay. Verco did not take it at St. Francis Island. Not recorded from Western Australia. Recorded from Port Phillip, Victoria, but not from Tasmania. It would seem to be very localised and confined to the southern coast of Australia. (Type locality—Kangaroo Island, South Australia). The elevated spiral tendency is stronger in this species than in other *Haliotis*. Individuals vary much in height, some have quite an elate spire.

SCISSURELLIDAE.

Minute, unicoloured, umbilicate, top-shaped or depressed, few-whorled, thin, inside pearly; spire small; body whorl large; mouth oval; outer lip with a slit, and with a differently sculptured band or anal fasciole encircling the whorls. Operculum circular, horny, thin, many-whorled, nucleus central. Distribution—World-wide, mostly in rather deep water. Fossil—Tertiary, about as many species as the Recent. Animal with a rather long rostrum, long ciliated tentacles bearing eyes at their outer bases; foot rather narrow; epipodium bearing four ciliated cirri on each side. The foramen or slit in the shell corresponds with the end of the rectum, and serves for the expulsion of waste matter, as in the case of the perforations of *Haliotis* and the tubes of *Typhis*.

Scissurella d'Orbigny 1824. Diminutive of *scissus*, a slit. Minute, depressed, not pearly, thin, with an open anal slit extending backward from the peristome; slit fasciole extending nearly to the apex and edged on either side by an upturned rim; sculpture spiral; spire small; body whorl large; mouth rounded. Operculum ovate, very thin, with an obscure subspiral nucleus. Young shells have no slit. Type—*S. costata* d'Orbigny.

S. ornata May 1908, Pl. 1, fig. 8. "The Ornate Scissurella." Minute, obliquely discoidal, strongly ribbed and spiralled; canal, a deep furrow, bordered by sharp, raised edges, the whole raised on a distinct ridge which surrounds the shell about midway between the suture and the periphery; on lower side is a smooth depressed area; yellowish-white; ribs, strong, sharp, begin below the furrow and continue round the whorl to enter the small but deep umbilicus; above the furrow, raised curved ribs roughly correspond to those below and continue uninterrupted from the central ridge to the suture; the spaces between these ribs are cancellated by six to eight spiral keels, much smaller than the ribs, and not passing over them; these spirals continue between the lower ribs, passing over the upper part of them, there giving them a crested appearance; protoconch of one-and-a-half turns, is squared by a beaded ridge, and is sunken below the level of the two rounded adult whorls, which are somewhat angled by the canal; mouth defined by a continuous narrow margin; slit open, deep, moderately wide. Height 1, diam. 1.5 mm. Cape Borda also Venus Bay, 4 specimens. (Type locality—Frederick Henry Bay, Tasmania, in kelp roots). It has a superficial resemblance to *Schismope beddomei* Petterd, but the ribs are more numerous and continuous, and with strong spirals, and it is a larger shell, and a true *Scissurella*. *Scissurella coronata* Watson, seems a near ally. The four South Australian specimens are not typical. They are larger, spirals stronger and radials weaker. They may prove to be a distinct species.

Scissurona Iredale 1924. Minute, ear-shaped, spire elevated, spiral sculpture; protoconch axially ribbed; adult whorls few, first rounded, later spreading and flattened above; slit well above the periphery, deep, edged with low keels; mouth large, oval; columella concave, broad, extending over the steep, narrow, umbilicus. Type—*Scissurella rosea* Hedley 1904 (New Zealand). *Scissurona* has a deceitful resemblance to *Incisura* Hedley (family *Fissurellidae*), but like all its relations in *Scissurellidae*, has the slit fasciole edged on either side by an upturned rim, which character is incompatible with *Incisura*. Iredale states that there is no close relationship between *Scissurona remota* Iredale (which he has listed as a subspecies of *S. rosea* Hedley, his type of *Scissurona*) and a true *Scissurella*.

S. remota Iredale 1924, Pl. 1, fig. 9. (*Scissurona rosea remota* Iredale 1924: = *Scissurella obliqua* Pritchard & Gatliff, not Watson: = *S. rosea* Hedley, for Tasmania, not Hedley for New Zealand). Ear-shaped, translucent, slightly umbilicate;

white, with protoconch rose; spiral threads, close, fine, on upper portion; spiral keels, sharp, distant, on lower; growth lines, faint, cross all the spirals; spire somewhat elevated; protoconch ribbed longitudinally; adult whorls three, early whorls rounded, last oval, flattened above; mouth large, oval, oblique; slit deep, well above the periphery, tapering to the termination half a whorl back, columella concave, broad, with a moderate lobe over the narrow umbilicus. Height 1.2, diam. 1.35 mm. Beach, Gulf St. Vincent, Guichen Bay, somewhat rare. Also Tasmania and Victoria. (Type locality—Twofold Bay, N.S.W.). From *Scissurella rosea* Hedley (a New Zealand shell) Iredale says his Australian subspecies, *S. rosea remota* is "more ear-shaped, the last whorl longer, the earlier whorls larger, the mouth not so patulate, and, consequently the slit apparently higher up. The Australian shell is more like the shape of *Incisura lytteltonensis* Smith, from which Hedley easily distinguishes the Neozelanic shell." (Iredale). Hedley replaced the name *obliqua* with *rosea* Hedley, for the Australian shell, though *rosea* was described from New Zealand. South Australian shells differ from the New Zealand in the slightly larger and more elevate spire, the typical size being 1.3 x 1.35 mm.

Schizotrochus Monterosato 1877. Minute, globosely conic, much like *Scissurella* but the slit fasciole is on the lower, instead of being on the upper part of the whorls. Operculum very thin. Type—*Scissurella crispata* Fleming 1832 (Europe). The young have no slit. A world-wide group of but few species; only one species being usually present in a faunal area, and that species having generally a wide range (Finlay). Pilsbry gives localities of *crispata*, the type of the genus, as Spitzbergen to Sicily and Azores, Greenland to New England, 4-790 fathoms; Culebra, West Indies; Pliocene of Italy and Rhodes. It is questionable whether *Schizotrochus* should be regarded as a genus or subgenus.

S. australis Hedley 1905. (*Scissurella*). Pl. 1, fig. 10. "The Southern Schizotrochus." Large, thin, trochiform, spire graduate, base tumid, narrowly umbilicate; white; last whorl above with about sixty-four curved oblique lamellate riblets; on spire the ribbing is finer, closer, and crossed by fine spiral threads which appear on the lower whorl in broken lengths; base with about twenty-five coarse, widely spaced radii, most prominent around the umbilicus, which they enter; on outer basal circumference are interstitial radii, crossed by half a dozen spiral threads; fasciole enfolded by broad margins. Height 2.5, diam. 3 mm. Dredged—Cape Jaffa, Beachport, Cape Wiles, 100-300 fathoms. (Type

locality—63-75 fathoms off Port Kembla N.S.W.). Hedley states that the lip does not project in a lobe over the base like that of *S. aequatoria* Hedley 1899, which is of similar size, shape and general appearance; *S. australis* also differs from that shell by having the base sculptured by a few distant coarse radii instead of dense fine riblets. South Australian and Cape Pillar (Tasmania) specimens have the spirals less valid.

S. gunteri sp. nov. Pl. 1, fig. 11. "Gunter's Schizotrochus." Minute, very thin, semitranslucent, trochiform, spire slightly gradate, base tumid, narrowly perforate; white; axial riblets, very numerous, microscopic, appearing more like accretional striae, on upper surface of last whorl (to the naked eye apparently smooth); spiral threads on base, numerous, indistinct, crossed by even less distinct radials; whorls four; slit fasciole margined by two thin, low keels. Height 1.1, diam. major 1.5, minor 1.3 mm. Locality—off Beachport, South Australia, 150 fathoms. (Reg. No. D10769 S. Aus. Mus.). Also, Cape Pillar, Tasmania, 100 fathoms. This species may, at first sight, appear to be a juvenile *S. australis* Hedley, but an immature shell of that species, about the same size, shows stronger sculpture visible to the naked eye, greater solidity of shell structure, spire higher and more gradate. Named after Rev. H. A. Gunter, Chairman (elected Aug. 1933) of the South Australian Naturalists, and an able conchologist.

Schismope Jeffreys 1856. Slit, enclosed, forming a hole in the outer wall of the aperture; slit fasciole shorter, not over one-and-a-half whorls in length. Type—*Scissurella cingulata* Costa 1861 (Mediterranean). *Schismope* is a *Scissurella* in which the anal slit becomes closed in the adult, and transformed into an oblong perforation like one of the holes of a *Haliotis*. The species inhabit deep water; there are a number of fossil forms described.

S. atkinsoni Tenison-Woods 1877, Pl. 1, fig. 12. (= *S. tasmanica* Petterd 1879: = *S. carinata* Watson 1886: not *S. carinata* A. Adams 1862 from Japan). "Atkinson's Schismope." Minute, globo-depressed; brown; spiral lirae, below the periphery, about three, rather separated and three more around the umbilicus; growth striae fine, scarcely perceptible; spire short, low, blunt; whorls three, rapidly widening, plane above; last whorl very rapidly descending toward the aperture, with a strong keel at the shoulder, occupied by the anal fasciole, and another keel at the periphery, the space between them concave; the keels are obsolete for a short distance behind the aperture; slit fasciole

present on the last one-and-a-half whorls, very narrow, its edges pinched up into a strong keel; the slit fasciole terminates about half a millimetre behind the peristome in a long narrow slit; aperture very oblique, ovate, narrowed above; columella slightly arcuate, nearly vertical; umbilicus narrowly perforated, funnel shaped, smooth inside. Height 2.5, diam. 2.5 mm. Beach—Guichen Bay; dredged—Beachport to St. Francis Island, 6-110 fathoms. Also Western Australia—Bunbury Beach. (Type locality—Blackman's Bay, Tasmania). Very variable in its sculpture. There may be no carination except that of the slit fasciole (is this *S. tasmanica* Petterd?) or only one keel, or two or three. The spiral lirae around the umbilicus may be vandy, when the three keels are marked, continuing their series as lesser keels to the edge of the umbilicus; or they may be distinct and lamellose when the keels are absent. Spiral lirae are present from suture to umbilicus, and these vary much in their visibility. Then the axial striae are sometimes obsolete, sometimes rather distant, sometimes distinct, crowded, and erect, especially between the suture and the slit fasciole, also sometimes between the keels at the base. Watson's *carinata* has a well marked keel. The young of this species will doubtless be taken some day for a *Trochus*, and the adolescent for a *Scissurella*, the great length of the old canal and the open foramen being peculiarly deceptive (Watson). Specimen illustrated, 2.5 x 2.6 mm., 104 fathoms; Neptune Island, carinate form.

S. beddomei Petterd 1884. "Beddome's Schismope." Minute, turbinate, depressed, thin; sordidly dull white; axially plicate, plicae more prominent at base; whorls three-and-a-half, protoconch flat; sinus conspicuous with raised margins; mouth ovate, of moderate size. Height 1, diam. .75 mm. Rare. Guichen Bay, 1 specimen. No records from Western Australia. Taken at Western Port, Victoria, Tasmania, North and South, ranging down to 100 fathoms. (May). (Type locality—N.W. coast of Tasmania).

S. pulchra Petterd 1884. "The Fair Schismope." Minute, thin; white; axially striate, striae passing over the two prominent keels at the periphery of the last whorl, giving them a nodose appearance; whorls four. Height 2, diam. 1 mm. Beach—Robe, Largs, to Venus Bay; dredged—Beachport to St. Francis Island, 35-150 fathoms; Gulf St. Vincent, depth not recorded. Also Western Australia—beach, Hopetoun, King George Sound. (Type locality—Tasmania, north-west coast). In form not unlike *S. atkinsoni* Tenison-Woods, but very different in ornamentation. In shell sand, but from its light texture generally more or less broken.

BREEDING HABITS OF THE AUSTRALIAN LONG-NECKED TORTOISE (*Chelodina longicollis*).

By KENNETH H. HARRINGTON

South Australian Aquarium Society.

Two years ago I decided to attempt to breed Australian freshwater tortoises. My first consideration was to create an environment as near to nature as possible, and to do this it was necessary to construct a pond with edges flush with the ground surface. Sloping up from this was a sand bank, reaching up about three feet at its highest point. Pond and sand bank were planted to give a natural effect, the whole (about 6 feet by 16 feet in size) then being enclosed by means of wire netting.

After several trips to the Murray I came to the conclusion that the long-necked tortoise (*Chelodina longicollis*) should be my first attempt, it being by far the most prolific of our freshwater Chelonians. At this stage I met my first obstacle, namely, the fact that there is apparently no means of determining the sex by external characteristics, although I think the length and breadth of the tail furnish some indication. The lack of definite information, however, made it necessary for me to collect a large number of the reptiles so as to increase the possibility of having both sexes. Further, I brought back only the larger specimens, considering that these should have reached maturity..

I introduced the tortoises to their new quarters and they quickly settled down. In a remarkably short time they became accustomed to being fed always from the same part of the pond and at their regular feeding time would be waiting in readiness. The reptiles spent much of the time in the water, but on sunny days were seen lazily basking on the sand bank. At first, if any person approached their enclosure they would immediately scuttle back to the water, with remarkable agility, when one considers their clumsiness of build. After a time, realising that no harm came of them if they stayed on the bank, they would drowsily continue their siesta. The diet consisted mainly of raw meat, but one could not consider them strictly carnivorous, for they were seen to feed on the tender shoots of aquatic plants as well. They were really active only in the summer, when their whole activities were centred on feeding and reproducing their species, whereas during the winter months they hibernated in the mud at the bottom of the pond.

As it was autumn when I established my observation pond, I anxiously awaited the following summer. Immediately the tortoises stirred from their winter sleep, I spent as much time as possible watching them. Considering that their breeding habits may have been similar to those of the marine turtles, which leave the sea on moonlight nights to deposit their eggs in the sand, I made frequent visits to their quarters whenever the moon was in evidence.

It was on one of these occasions that I noticed one of the tortoises come out of the water and, after manouvering around for some time, apparently endeavour to settle itself down into the sand; in a short time, however, it returned to the water, not to appear again that night.

I was at my post again the following night and at about 7.30 p.m. the same tortoise left the water again; I recognised this particular specimen by the fact that, probably owing to an accident when young, it had an extra costial plate on the carapace. It proceeded up the sand bank to a distance of about 3 feet from the water's edge and without hesitation commenced to settle itself down in the sand. After levelling the sand by this means over a space of a little more than the area of the shell, it commenced to excavate the nesting burrow, the procedure being as follows:—

First, the tortoise turned to one side sufficiently to bring one hind leg into the centre of the levelled patch; then, supporting itself by means of the other hind leg and two fore-legs, it scratched with the hind foot, loosening the sand. Next, with the full webbing of the hind foot acting as a shovel, it scooped out a mass of sand and placed it carefully at the posterior margin of the cleared space. Without attempting a second "foot-full" (and this applies to all I have seen burrowing) it turned around to the other side, thus bringing the other foot into play, and went through the same process with it.

Periodically it ceased operations to rest, for there is no doubt that it found the work laborious; incidentally, respiration was considerably increased during these activities.

It continued burrowing in this fashion until, with the leg fully extended, it could just reach to the bottom, and then, apparently, was content.

Repeated observation lead me to believe that the depth of the burrow depends on the size of the tortoise to a certain extent; smaller specimens having only short legs naturally dig a shallow burrow, while a large one, with longer legs, digs a deeper one. The average completed burrow measures approximately $2\frac{1}{2}$ inches to 3 inches in diameter with a depth of about 5 inches; it takes about half an hour to prepare, but much depends, of course, on the burrowing medium.

After the burrow is completed to its satisfaction, the tortoise commences to deposit the eggs, which are white and elongated in form; *Chelodina longicollis* will lay anything up to twenty eggs in the one nesting burrow. After oviposition it pushes the sand back until the eggs are completely covered and the burrow obliterated, taking care to level the surface, so that one would find it very difficult to discern any traces of the sand having been disturbed.

The eggs are left for the heat of the sun to hatch, the mother taking no part in the tending of the young.

Here my observation end for the present, because, unfortunately, the nesting burrows were discovered by rats which ate all the eggs.

The late Mr. Edgar R. Waite, in his hand-book on "The Reptiles and Amphibians of South Australia," states that the eggs are laid in November or December and the young appear in February or March. The account of the making of the nesting burrow as quoted by Mr. Waite does not agree with my observations.

In spite of the disappointments of last year, I am keenly awaiting their breeding activities this summer and intend to take more precautions against marauders.

A. MAGPIE—AND A BROKEN LEG.

By A. F. James from observations by Mrs. A. F. James.

This is a true account of a wild hen magpie's struggle for life against the handicap of a broken leg.

Before commencing, however, it is necessary for me to say that our home at Brighton, South Australia, is situated in a thinly-populated part, and that there are numerous pine and gum trees very close to it, which are in great favour with birds of most of the usual breeds. When going there to live about two years ago we took a laughing jack with us—a tame bird that had strayed to our previous home half dead and apparently mauled by cats and dogs, and which my wife had nursed back to health.

Not very long after moving in, a pair of magpies with a young one attacked the jack, who has the run of the yard. The commotion brought us out, and we were just in time to see the jack succeed in beating off the magpies. After this the magpies would come into the yard and bathe in the jack's water and also eat any meat that he left lying around but would never approach nearer than about five or six yards from him. It was marvellous the way they knew when it was their feeding time, and to hear them sing to him from their "safe margin" for him to move away and leave them some of his meat. We became more and more interested in the magpies as the months went on, as the same pair came always and the cock bird was a magnificent specimen, seeming a trifle larger than the usual bird. They also began to get comparatively unafraid of us. Mrs. James fed them fairly frequently by cutting up meat and leaving it on the back lawn.

One morning somewhere towards the end of last March (1932) my wife was watching through the back wire door when she saw the hen magpie flounder on to the lawn and rest there on one side of her body. She looked very distressed, and Mrs. James realised that something was wrong, and taking care not to disturb the bird in any way by going out into the yard, continued to watch her at various intervals. She stopped in the same position for about five hours that day. The next day she was back again and rested in the same way, only for a shorter period, but she came back in the afternoon and happening to see her flying it was observed that one of her legs was broken. She had evidently come straight to the only sanctuary she knew where water and food could be obtained easily and without having to move around for it.

Of course, Mrs. James started putting out food every day and the magpie came daily and fed and rested. She had great difficulty in landing and taking off, and how she perched at night

I could not say. The cock bird generally accompanied her on these visits. This went on for about five or six weeks—the most noticeable point at this time being that the cock bird became far more tame, whilst the hen bird was very frightened.

Then, suddenly, the injured bird stopped coming to the yard and we thought that she must have died. After two or three days, however, my wife noticed that the cock bird would come into the yard and proceed to eat about half the meat left there, and that he would then pick up the rest until his beak was full and then fly away. We at once concluded that his mate was still alive, and that he was feeding her. (This was evidently the case, as after events show). Following about two weeks of this procedure, the hen bird suddenly re-appeared in the yard again, and she seemed to be slightly better as she was far more cheeky. She took no notice of the laughing jack, and would go right up to where he was perched and take a piece of meat, although the jack would pick at her all the time. (The jack did not actually pick her, but seemed to be giving her to understand that it was all right while she was sick, but that she was not to try and make it a regular thing).

She seemed very hungry at this period, and that is probably why she "stole" as well as having the food left for her. Also the jack's meat was always cut up very big, and she could not use her feet to tear it it was wonderful how she swallowed it. Her broken leg was still hanging, and she was very awkward in any movements. In another two or three weeks it was seen that she was far more comfortable, and was landing and taking-off easily, and was, in fact, better in every way. Watching her closely, Mrs. James found that her leg was gone from the break downwards—whether it had come off naturally, or if she had got it off herself is, of course, a mystery. Anyhow, it was gone, and she was certainly a different bird. She became more tame, and was in the yard three or four times a day, and always looking for meat. In fact, Mrs. James started feeding her two or three times a day, and she took it every time. Early in the morning she and her mate would advertise that they were ready for breakfast by singing a song from the clothes line arm, and at night she would be there again—but not always accompanied by her mate. Then, of course, there was morning and afternoon lunch. As the cock bird came only about once a day we concluded that he liked his natural food, which she, handicapped as she was, could not get. The lady seems quite at home now, and will probably live to bring up more families.

I should like to mention one or two points that, in the whole incident, were, to us, outstanding. The first is the wonderfully plucky struggle put up by the hen in the face of her great adversity, and the instinct that showed her where to come to find food and rest. The second is the unfailing devotion shown by the cock bird during the whole time. He would come into the yard and warble away—in our imagination practically asking for food for his mate. He became particularly tame, and while she was absent for two or three weeks would do practically anything to get food. I would also add that at no time did we attempt to get close to either bird, as we were afraid we might frighten them. We still have “our” magpies, and words cannot describe the pleasure this gives to us after the anxiety with which we watched their struggle.

Perhaps one little incident that happened prior to the bird breaking her leg may be interesting. Mrs. James heard the magpies singing, and on looking saw them both on the ground about five yards from the laughing jack, who had just been fed, and had left some meat on his perch. One of the magpies would go in a little closer and the jack would just straighten up and back would go maggie. This went on for some minutes—the magpies singing all the time. Then suddenly the hen bird went around *behind* the jack, and while the cock bird held his attention from the front, walked in very close to the perch. Without any warning the hen bird darted in and pulled the jack by the tail, and as she did so the cock bird darted in and picked up the meat and off they went. The hen bird pulled hard, too, as she nearly brought the jack to the ground. How the magpies arranged that piece of strategy I do not know, but it certainly shows the intelligence they have.

PUBLISHING DATES OF THE LAST FOUR VOLUMES OF "THE SOUTH AUSTRALIAN NATURALIST."

Requests have been received for the actual dates of publication of "The South Australian Naturalist" by those interested in elucidating priority in Zoological Nomenclature. The following list is supplied for some of the volumes of which we have a record. Future issues will have the actual dates of publication printed on the cover.

Vol. xi, No. 1, (Nov.)—	Published, December 5, 1929.
Vol. xi, No. 2, (Feb.)—	„ March 31, 1930.
Vol. xi, No. 3, (May)—	„ July 8, 1930.
Vol. xi, No. 4, (Aug.)—	„ September 6, 1930.
Vol. xii, No. 1, (Nov.)—	„ December 20, 1930.
Vol. xii, No. 2, (Feb.)—	„ February 28, 1931.
Vol. xii, No. 3, (May)—	„ May 27, 1931.
Vol. xii, No. 4, (Aug.)—	„ September 11, 1931.
Vol. xiii, No. 1, (Nov.)—	„ December 31, 1931.
Bol. xiii, No. 2, (Feb.)—	„ April 15, 1932.
Vol. xiii, No. 3, (May)—	„ June 14, 1932.
Vol. xiii, No. 4, (Aug.)—	„ September 30, 1932.
Vol. xiv, No. 1, (Nov.)—	„ December 30, 1932.
Vol. xiv, No. 2, (Feb.)—	„ March 10, 1933.
Vol. xiv, No. 3, (May)—	„ June 30, 1933.
Vol. xiv, No. 4, (Aug.)—	„ August 31, 1933.

FIELD NATURALISTS' SECTION OF THE
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Publications of the Section.

No. 1.—“The National Parks of Australia,” by Wm. H. Selway. (Out of print).

PUBLICATION NO. 2

GEOLOGICAL AND BOTANICAL NOTES

on the

VICTOR HARBOUR DISTRICT

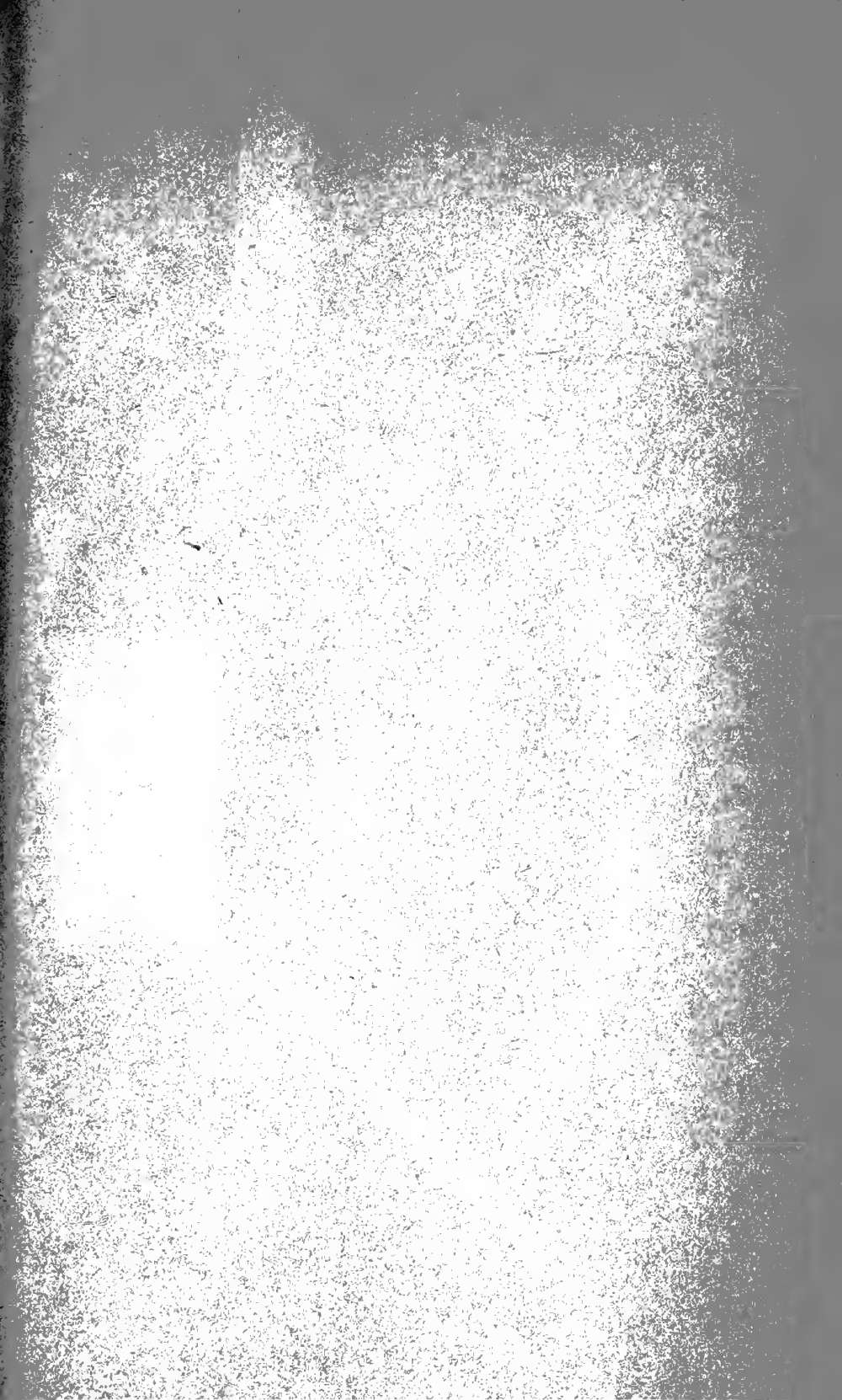
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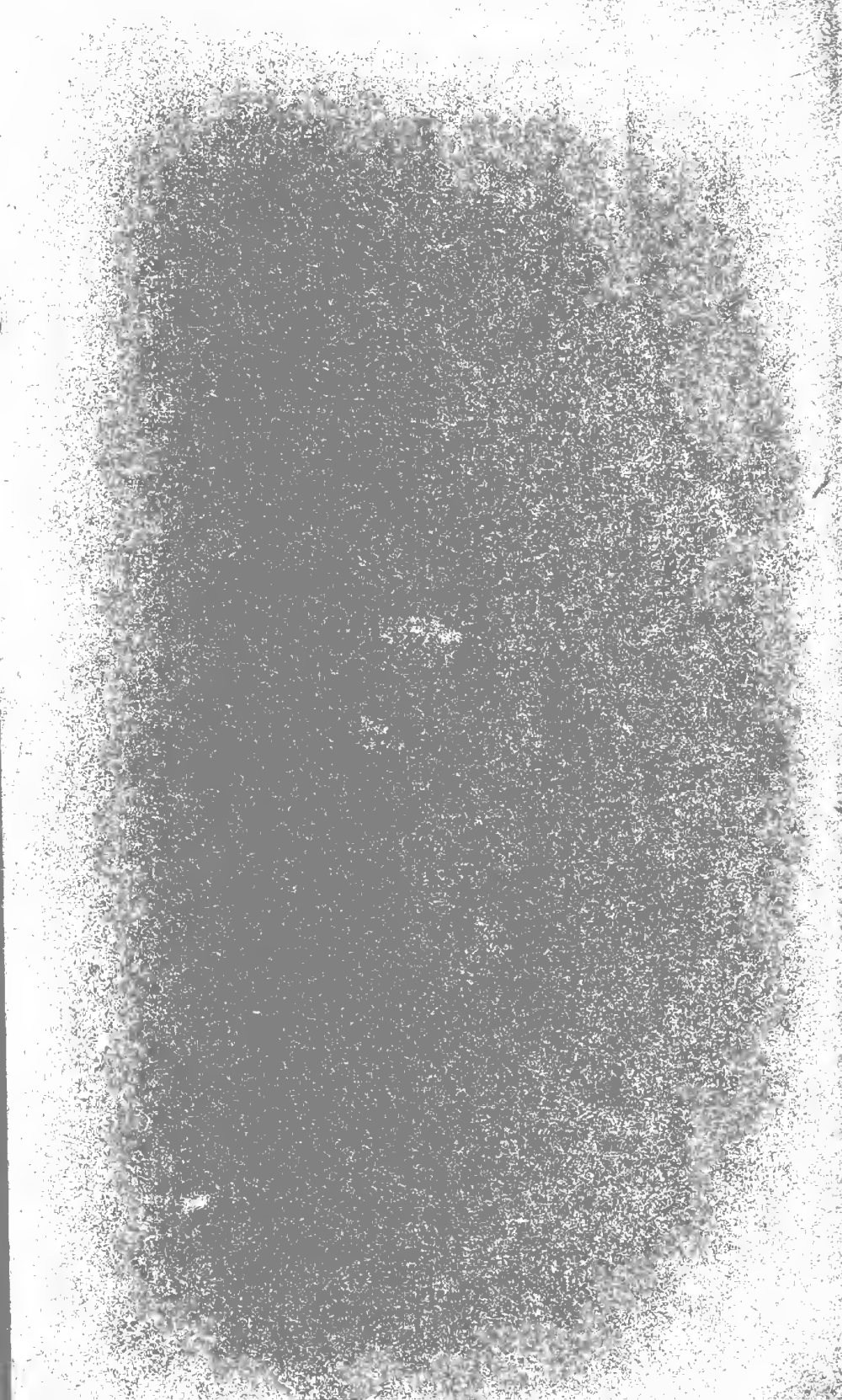
PROF. J. B. CLELAND, M.D., and

PROF. WALTER HOWCHIN, F.G.S.

Published by Cole's Book Arcade,

Price 1/.





VOL. XV, No. 2.

March 27th, 1934.



THE South Australian Naturalist

THE JOURNAL OF THE FIELD NATURALISTS'
SECTION OF THE ROYAL SOCIETY OF SOUTH
AUSTRALIA AND OF THE SOUTH AUSTRALIAN
AQUARIUM SOCIETY.

Hon. Editors: Wm. Ham, F.R.E.S.
and BERNARD C. COTTON.

The Author of each article is responsible for the facts and opinions recorded.

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Published Quarterly.

Price: NINEPENCE.

Obtainable from Rigby's Book Shop, Grenfell Street, Adelaide.
Registered at the G.P.O., Adelaide, for transmission by Post as a
Periodical.

FELSTEAD & OMSBY, PRINTERS, Delmont's Buildings, Anster Street, Adelaide.

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EXCURSIONS.

April 14—Happy Valley. General. Leader, Mrs. Pearce.

April 25—Kuitpo Forest. Forestry. Leader, Chairman.

May 12—Waite Institute. Agriculture, etc. Leader, Lt. Col. Fulton,

May 26—Zoological Gardens. Mammals. Leader, Mr. H. H. Finlayson

June 4—Hallett's Cove. Glacial Features. Leader, Dr. C. Fenner.

June 23—Museum. General. Leader, Mr. H. M. Hale.

LECTURES AND EVENING MEETINGS.

April 17—"Botanists and Their Work," Mr. J. M. Black.

*May 15—"Agriculture," Dr. A. E. V. Richardson.

June 19—"Birds, and their Usefulness in regard to the State," Captain S. A. White.

The South Australian Naturalist.

VOL. XV. ADELAIDE, MARCH 27th, 1934. No. 2.

LIST OF PLANTS OCCURRING BETWEEN OUTER HARBOUR AND SELICK'S BEACH.

By J. B. CLELAND, M.D.

(Continued from S.A. Naturalist, Vol. XV, No. 1, p. 13)

MIRITACEÆ.—*Herichtha pentandra* R.Br., in swampy soil under tea-tree, attacked by a rust, Grange. *Trichium alopecuroides* Lindl., sandhills at Fulham, Pinery, Marino, Pt. Noarlunga. *T. nobile* Lindl., Marino (flowers fragrant). *T. spathulatum* R.Br., Marino, Hallett's Cove, Pedlar's Beach, Pt. Noarlunga. **Amaranthus viridis* L., Brighton. **A. patulus* Bertol. f., Fulham. *Alternanthera denticulata* R.Br., creek at Fulham.

IZOICEÆ.—**Cryophytum crystallinum* (L.), N.E.Br., Ice-Grange. *Carpobrotus acquilaterus* (Haw.), N.E.Br., Angular Pigface, Grange. *Disphyma australe* (Soland.), J. M. Black, Round-leaved Pigface, Grange. *Tetragonia implexicoma* (Miq.) Hook.f., Grange, Pedlar's Beach (fruit reddish-orange). *Gabunia serunda* (L.f.) Sond., north-east edge of Pinery near Port River.

PORTULICACEÆ.—*Portulaca oleracea* L., Purslane, Fulham. *Calandrinia volubilis* Benth., Pinery, south of Hallett's Cove, Sellick's scrub. *C. pygmaea* F.A.M., Pinery, south of Hallett's Cove, Sellick's scrub. *C. calyptata* Hook. f., Sellick's scrub (Oct.)

CARYOPHYLLACEÆ.—*Sagina apetala* Arduino., Seaton (Oct.), south of Hallett's Cove. *Cerastium glomeratum* Thunb., Mouse-ear Chickweed. **Moenchia erecta* (L.) Gaertn. Mey. et Scherb., south of Hallett's Cove. *Stellaria palustris* Retz., Swamp Starwort, amongst rocks, Field R. at Hallett's Cove (petals a good deal longer than sepals). *S. media* (L.) Vill., Chickweed. *Spergularia rubra* (L.) J. et C. Presl., Grange. *S. marginata* (DC.) Kitt, saline swamp at Glenelg, Aldinga. *Polycarpon tetraphyllum* Loefl., Grange. *Silene vulgaris* (Moench.) Garcke, Bladder Champion, Brighton. **S. gallica* L., French Catchfly.

- RANUNCULACEÆ.**—*Clematis microphylla* DC., sandhills at Grange. *Ranunculus muricatus* L., Grange.
- LURICEÆ.**—*Cassytha glabella* R.Br., Pt. Noarlunga, cliffs near Aldinga. *C. pubescens* R.Br., Sellick's scrub, Aldinga.
- PAPIVERICEÆ.**—*Papaver dubium* L., Long-headed poppy, Noarlunga. **P. hybridum* L., Rough Poppy, Noarlunga, Reynella. **Fumitaria muralis* Sond., Fulham. **F. densiflora* DC., Noarlunga.
- CRUCIFERÆ.**—**Nasturtium officinale* R.Br., Water Cress, Field River (Hallett's Cove). **Sisymbrium orientale* L., Wild Mustard, Grange. *Lepidium hyssopifolium* Desv., Fulham. **L. draba* L., Hoary Cress, Reedsbeds (as a pest, called 'carrot weed'), Noarlunga (Oct.). *Hutchinsia procumbens* (L.) Desv., Outer Harbour beach (Oct.). *Stenopetalum lineare* R.Br., sandhills at Outer Harbour. **Coronopus didymus* (L.) Sw., Pt. Noarlunga. *Cakile maritima* Scop., Sea Rocket, near shore-line, Grange, etc. **Rapistrum rugosum* All., Grange, south of Hallett's Cove (Nov.), etc.
- DROSERICÆ.**—*Dracera Whittakeri* Planch., near Hallett's Cove.
- CRISULACEÆ.**—*Crassula Siberiana* (Schultes.) Ostenf., Pinery. *C. colorata* (Nees) Ostenf., south of Hallett's Cove. *C. macrantha* (Hock. f.) Diels et Pritzl., south of Hallett's Cove. *C. pedicelloxa* (F.v.M.) Ostenf., Seaton (Oct.)
- PITTOSPORICEÆ.**—*Pittosporum phillyreoides* DC., Fulham, Hallett's Cove scrub. *Bursaria spinosa* Cav., Sellick's scrub. *Billardiera cymosa* F.v.M., near Pinery, Pedlar's Beach, Sellick's scrub. **Rosa* sp., Fulham.
- LEGUMINOSÆ.**—*Acacia armata* R.Br., Kangaroo Bush, Pinery, Hallett's Cove scrub. *A. obliqua* A. Cunn., nearly prostrate, Pedlar's Beach. *A. spinosens* Benth., Sellick's scrub. *A. Victoriæ* Benth., Prickly Acacia, near Brighton, near Reynella. *A. ligulata* A. Cunn., Umbrella Bush, Grange, Pinery, Hallett's Cove, Pedlar's Beach. *A. pycnantha* Benth., Golden Wattle, Grange, Pinery, Sellick's scrub. *A. longifolia* (Andr.) Willd., var. *Sophoræ* F.v.M., Glenelg. *Eutaxia microphylla* (R.Br.), J. M. Black, Marino, Hallett's Cove, Pedlar's Beach. *Pultenaea tenuifolia* R.Br., Marino, cliffs at Pt. Noarlunga. *Lupinus pilosus* L., Grange. **Trifolium procumbens* L., Hop Clover, Fulham, Aldinga. **T. tomentosum* L., Woolly Clover, Seaton, Aldinga, etc. *T. repens* L., White Clover, Fulham. *T. domcatum* L., Grange. **T. subterraneum* L., Grange, Aldinga. **T. scabrum* L., Grange, south of Hallett's Cove. **T. argense* L., Hare's-foot Clover, Fulham. **T. incarnatum* L., Crimson Clover. **T. angustifolium* L., Fulham. **Trigonella monspeliaca* L., Outer Harbour.

- **Melilotus indica* All., Melilot, Grange. **Medicago sativa* L., Lucerne, Brighton. **M. tribuloides* Desr. var. *truncatula* Koch., Seaton, Marino, Pt. Noarlunga. **M. denticulata* Willd., Toothed Medic, Grange. **M. praecox* DC. *Lotus australis* Andr., Grange, Pedlar's Creek, Pt. Willunga. *Psoralea patens* Lindl., near Glenelg, Hallett's Cove. *Swainsona Behriana* (F.v.M. Herb.) Black, Seacliff (not noticed in recent years). **Vicia sativa* L. var. *angustifolia* Wuhl., Grange, near Hallett's Cove. *Kennedya prostrata* R.Br., Scarlet Runner, Grange, Pinery, Pt. Noarlunga. *Hardenbergia monophylla* (Vent.) Benth., Native Lilac, Hallett's Cove scrub. *Glycine clandestina* Wendl., Hallett's Cove, Moana.
- GERANIACEAE.—*Geranium pilosum* Forst., Glenelg. **Erodium botrys* (Cav.) Bertol. **E. cicutarium* (L.) L'Her. *Pelargonium australe* Willd., sandhills at Grange, etc.
- OXALIDACEAE.—*Oxalis corniculata* L. **O. cernua* Thunb., Soursob.
- ZYGOPHYLLACEAE.—*Nitroaria Schoberi* L., Nitre-bush, Grange, Moana. *Zygophyllum Billardieri* DC., Marino, Pt. Noarlunga, cliffs at Pedlar's Beach (Oct.). *Z. glaucescens* F.v.M., Marino.
- RUTACEAE.—*Correa rubra* Sm., Sellick's scrub.
- POLYGALACEAE.—*Comesperma volubile* Labill., Marino, cliffs south of Hallett's Cove, Moana cliffs. *C. calymega* Labill., Aldinga cliffs.
- EUPHORBIACEAE.—**Ricinus communis* L., Castor-oil Plant, Fulham, Hallett's Cove. *Adriana Klotzschii* (F.v.M.) Muell. Arg., near Glenelg. **Euphorbia falcata* L., Grange, Pinery. **E. lathyris* L., Caper Spurge, Grange (Nov.) **E. terracina* L., Brighton. **E. peplus* L., Fulham. *Poranthera microphylla* Bronn. *Beyeria Leschenaultii* (DC.) Baill., rounded shrubs, Moana cliffs, south of Hallett's Cove.
- STACKHOUSIACEAE.—*Stackhousia monogyna* Labill., Moana, Sellick's scrub.
- SAPINDACEAE.—*Dodonaea viscosa* L., Glenelg sandhills, Pinery, Hallett's Cove. *D. hexandra* F.v.M. (?), cliffs south of Hallett's Cove.
- RHAMNACEAE.—*Pomaderris racemosa* Hook., Hallett's Cove, Moana cliffs.
- MALVACEAE.—*Lavatera plebeja* Sims, Australian Hollyhock. **Malva parviflora* L. *Plagianthus microphyllus* F.v.M., swamps and also cliffs at Pt. Noarlunga, swamps at Port Adelaide.

- STERCULIACEAE.**—*Thomasia petalocalyx* F.v.M., Pinery, Sellick's scrub (Dec.).
- DILLENIACEAE.**—*Hibbertia stricta* R.Br., south of Hallett's Cove, Sellick's scrub. *H. stricta* var. *glabriuscula* Benth., Pinery (Oct.), Sellick's scrub. *H. virgata* R.Br., Sellick's scrub. *H. fasciculata* R.Br. var. *pubigera* Benth., Pinery (Oct.).
- FRANKENIACEAE.**—*Frankenia pauciflora* DC., Grange, Pt. Noarlunga, etc. *F. pulcherrima* L., prostrate, cliffs north of Pt. Noarlunga (Nov.).
- THYMELAEACEAE.**—*Pimelea glauca* R.Br., Pinery (Oct.). *P. humilis* R.Br. (?), Pt. Noarlunga. *P. flava*, R.Br., cliffs, Moana, etc. *P. serpyllifolia* R.Br., Grange, Glenelg, cliffs. *P. curviflora* (yellow flowers), Hallett's Cove, Pt. Noarlunga.
- LYTHRACEAE.**—*Lythrum Hyssopifolia* L., Lesser Loose-strife, Grange, Aldinga.
- MYRTACEAE.**—*Leptospermum myrsinoides* Schl., Sellick's scrub. *Kunzea pomifera* F.v.M., Grange and Glenelg sandhills, Sellick's scrub. *Melaleuca halmaturorum* F.v.M., Port Adelaide river and swamps. *M. pubescens* Schau., Black Tea-tree, sandhills at Grange, Hallett's Cove scrub, Moana, Sellick's scrub. *Eucalyptus odorata* Behr. et Schl., Peppermint Gum, Pinery, Hallett's Cove and Sellick's scrub. *E. rostrata* Schl., Red Gum, Reedbeds. *E. leucoxydon* F.v.M., Blue Gum, Pinery. *E. fasciculosa* F.v.M., Pink Gum, Sellick's scrub. *Calythrix tetragona* Labill., Marino, Pt. Noarlunga cliffs, Sellick's scrub.
- ORNITHOCEAE.**—*Oenothera odorata* Jacq., Grange. *O. longiflora* Jacq., Grange.
- HALORRHAGIDACEAE.**—*Halorrhagis tenerioides* DC., cliffs at and south of Hallett's Cove. *H. heterophylla* Brongn., Sellick's scrub.
- UMBELLIFERAE.**—*Didiscus pusillus* (DC.) F.v.M., Pinery, Sellick's scrub. *Bupleurum semicompositum* L., base of cliffs at Marino and south of Pt. Noarlunga. *Daucus glochidiatus* (Labill.) Fisch. Mey et Ave-Lall. *Apium australe* Pet.-Thou. Sea Celery. *Foeniculum vulgare* Mill., Fennel.
- LEGUMINOSAE.**—*Astroloma humifusum* (Cav.) R.Br. var. *denticulatum* (R.Br.) J. M. Black, Marino, Pinery. *A. conostephioides* (Sond.) F.v.M., Sellick's scrub. *Leucopogon parviflorus* (Andr.) Lindl., Grange, Moana, Sellick's scrub. *L. rufus* Lindl., Sellick's scrub (Oct.). *Acrotriche patula* R.Br., Marino, Moana and Pt. Noarlunga cliffs.

PRIMULACEAE.—*Impatiens arcensis* L., *I. minima* Mill., *Samolus repens* (Forst.) Pers., Grange, etc.

PLUMBIGINACEAE.—*Statice occidentalis* Lloyd, Sea Lavender, Patawalonga Creek at Glenelg. *S. piloclada* Boiss., Pt. Adelaide R., Lefevre's Pen., Patawalonga Creek (Dec.).

OLEACEAE.—*Olea europaea* L., Olive, Grange.

LOGANIACEAE.—*Logania linifolia* Schl., Hallett's Cove.

APOCYNACEAE.—*Hyxia buxifolia* R.Br., near Glenelg, Hallett's Cove, Moana cliffs.

ISCLERIIDACEAE.—*Achypias rotundifolia* Mill., Broad-leaved Cotton-bush, near Fulham, near Outer Harbour.

CONVOLVULACEAE.—*Convolvulus crubescens* Sims, Australian Bindweed. *C. arcensis* L., Lesser Bindweed, Brecklay's Creek at Fulham. *Calystegia sepium* (L.) R.Br., Ground Bindweed, Reedbeds. *Wilsonia rotundifolia* Hook., Grange Pinery.

BORRAGINACEAE.—*Heliotropium curassavicum* L., near Fulham. *H. europaeum* L., Fulham. *Cynoglossum vavilovii* R.Br., Marino. *Lithospermum arcense* L., Corn Groundsel. *Echium plantaginicum* L., Salvation Jane.

VERBENACEAE.—*Verbena supina* L., Fulham. *V. bicolor* L., Fulham.

LIBANACEAE.—*Marrubium vulgare* L., Horehound. *Salvia verbenacca* L., Wild Sage, Noarlunga. *Westringia rigida* R.Br., cliffs at Hallett's Cove and south thereof.

SOLANACEAE.—*Solanum nigrum* L., Black Nightshade. *S. sodomacum* L., Apple of Sodom. *Lycium toxicarium* Miers, African Box-thorn. *Nicotiana glauca* L., Native Tobacco, Hallett's Cove, Pt. Noarlunga. *N. glauca* Griseb., Tobacco Tree, behind sandhills at Fulham, Moana. *Datura* sp., Torrens River at Fulham.

SCROPHULARIACEAE.—*Verbascum virgatum* With., *Leptorhynchium Orontium* L., Lesser Snapdragon, Fulham. *Ligularia Elatine* (L.) Mill., Pointed Toadflax. *Mimulus* sp., R.Br., between Fulham and Glenelg. *Zaluzianskya latifolia* (Thunb.) Choisy., in sand near Pinery (Oct.). *Argemone collina* R.Br., Marino. *Bartschia latifolia* (L.) Sibth. & Sm.

OROBANCHACEAE.—*Orobancha australiana* F.A.M., Australian Broomrape—specimens have been exhibited at several Wild-flower Shows from the sandhills at Pt. Noarlunga; several colonies occur on the sandhills about two miles south of Henley Beach, parasitic on *Senecio laetus*.

MYOPORACEAE.—*Myoporum insulare* R.Br., Blue-berry Tree Grange, Hallett's Cove, Moana, Sellick's scrub. *M. parvifolium* R.Br., prostrate, at edge of salt-water overflows from the Port River at the Alberton end of the Pinery, on the cliffs at Pt. Noarlunga.

PLANTAGINACEAE.—*Plantago varia* R.Br., Variable Plantain, cliffs at Moana. **P. lanceolata* L., Ribgrass. **P. Coronopus* L., Buck's-horn Plantain, Grange, Pinery. **P. major* L., Greater Plantain, banks of Torrens at Fulham.

RUBIACEAE.—*Opercularia varia* Hook. f., cliffs at Aldinga. *Asperula scoparia* Hook. f., cliffs south of Hallett's Cove. *Galium ciliare* Hook. f., Hallett's Cove. *G. umbrosum* Sol., Hallett's Cove. **G. tricornue* With., Three-horned Bedstraw, near Reynella, Noarlunga. **G. murale* (L.) All. **Sherardia arvensis* L., Field Madder.

VALERIANACEAE.—**Valerianella discoides* (L.) Lois, Marino, Aldinga.

DIPSACACEAE.—**Scabiosa maritima* L., Purple Pincushion.

CUCURBITACEAE.—**Citrullus vulgaris* Schrad., Bitter Melon, south of Hallett's Cove. **Cucumis myriocarpus* Naud., Paddy Melon.

CACTACEAE.—**Opuntia monacantha* Haw., Prickly Pear, Fulham.

CAMPANULACEAE.—*Wahlenbergia gracilis* (Forst. f.) ADC., Native Bluebell. *Lobelia anceps* Thunb., between Fulham and Glenelg.

GOODENIACEAE.—*Goodenia affinis* De Vriese, cliffs at Aldinga Bay. *G. amplexans* F.v.M., south of Hallett's Cove, Sellick's scrub. *G. albiflora* Schl., cliffs south of Hallett's Cove (Nov.), on limestone on main road to Aldinga. *G. pinnatifida* Schl., Aldinga and Moana cliffs. *G. pusilliflora* F.v.M., Hallett's Cove. *Felicia paradoxa* R.Br., Marino, Aldinga and Moana cliffs. *Scacvola crassifolia* Labill., sandhills at Grange, etc., Pt. Noarlunga. *S. microcarpa* Cav., Pt. Noarlunga. *S. linearis* R.Br., var. *confertifolia* J. M. Black, cliffs south of Hallett's Cove. *Dampiera rosmarinifolia* Schl., Wild Rosemary (flowers lilac), cliffs south of Hallett's Cove, Moana cliffs (Oct.). *D. lanceolata* A. Cunn., forming large patches in Sellick's scrub.

COMPOSITÆ.—*Brachycome ciliaris* (Labill.) Less., sandhills at Outer Harbour (Oct.), Hallett's Cove (Sept.). *Minuria leptophylla* DC., cliffs at Hallett's Cove, Pt. Noarlunga, Moana, Aldinga (Sept., Nov.). *Calotis crinacea* Steetz, Pinery. ²*Aster subulatus* Michx., near Fulham, Ethelton. ²*Erigeron crispus* Pourr. (*E. linifolius* Willd.), Glenelg, Brighton. *Fittadinia triloba* (Gaudich.) DC. (*F. australis* A. Rich.) Grange, Hallett's Cove, Noarlunga. *F. tenuissima* (Benth.) J. M. Black, Aldinga. *Olearia axillaris* (DC.) F.v.M., Glenelg. *O. lepidophylla* (Pers.), Benth., Pinery (Nov.). ²*Xanthium spinosum* L., Bathurst Burr, Ethelton, Fulham. *Colula coronopifolia* L., swamps at Grange, Pedlar's Beach. *C. australis* (Less.) Hook.f., Pinery, Hallett's Cove. *Erechtites pteridioides* Turcz., Sellick's scrub. *Scorcia brachyglossus* F.v.M., Seaton. ²*S. vulgaris* L., Common Groundsel, Hallett's Cove. *S. laetus* Sol., Grange, Hallett's Cove. ²*Tripteris clandestina* Less., Pinery, fields near Brighton and Marino. ²*Tretotis stoechadifolia* Berg., Grange and Glenelg sandhills. *Gymnanotus Larssonianus* Gaudich., south of Hallett's Cove. ²*Cryptostemma calendulaceum* (L.) R.Br., Cape Daudelon, Grange. *Graphalium japonicum* Thunb., Hallett's Cove, Aldinga. *Gn. luteo-album* L., Seaton Golf-links. *Cassinia spectabilis* (Labill.) R.Br., on burnt ground at Sellick's scrub. *C. arcuata* R.Br., Hallett's Cove scrub (with galls suggesting flower buds). *Helipterum australe* (A. Gray) Druce, Aldinga Bay cliffs. *H. demissum* (A. Gray) Druce (*H. exiguum* F.v.M.) (?), cliffs at Pedlar's Beach. *Helichrysum leucopsidium* DC., Pinery, Aldinga cliffs. *H. apiculatum* (Labill.) DC., Pinery, Glenelg, south of Hallett's Cove. *H. semipapposum* (Labill.) DC., near Hallett's Cove. *Podosperma angustifolium* Labill., Pinery, Aldinga. *Leptorhynchus squamatus* (Labill.) Less. (?), Pedlar's Beach. *Mollisia tenuifolia* Cass., Pinery, south of Hallett's Cove, Sellick's scrub. *Rutidosia multiflora* (Nees.) B. L. Robinson, Marino (Oct.). *Podolepis rugata* Labill., cliffs at Pedlar's Beach. *P. Lessonii* (Cass.) Benth., Hallett's Cove, cliffs at Aldinga Bay. *P. canescens* A. Cunn., Hallett's Cove. ²*Trule graveolens* (L.) Desf., Stinkwort, Grange. *Angianthus strictus* (Steetz) Benth., Marino, cliffs at Port Noarlunga. *Tomentosus* Wendl., cliffs at Port Noarlunga to Aldinga. *Calocephalus Brozarii* (Cass.) F.v.M., Grange, Pedlar's Beach. *C. citreus* Less., cliffs, Marino to Noarlunga. *Graphalodes uliginosum* A. Gray, Hallett's Cove, Port Noarlunga. *Graspedia uniflora* Forst. f., Bachelor's Button, Hal-

lett's Cove. **Cynara Cardunculus* L., Wild Artichoke, Grange, Port Noarlunga. **Cirsium lanceolatum* (L.) Scop., Spear Thistle, Fulham. **Carduus tenuifolius* Curtis, Slender Thistle, Noarlunga. **Silybum Marianum* (L.) Gaertn., Milk Thistle, Fulham. **Onopordon acaule* L., Stemless Onopordon, Marino. **Centaurea Calcitrapa* L., Star Thistle, Fulham. **C. melitensis* L., Maltese Cockspur, Marino. **Carthamus lanatus* L. (*Centrophyllum lanatum* (L.) DC.), Woolly Star Thistle, Fulham. **Cichorium Intybus* L., Chicory, Glenelg, Brighton. *Microseris scapigera* (Forst. f.) Schultz-Bip, Hallett's Cove. **Hedypnois cretica* (L.) Willd., cliffs at Moana (Oct.) and Aldinga. **Hypochaeris radicata* L., Rooted Cat's-ear. **H. glabra* L., Glabrous Cat's-ear, Grange. **Urospermum picroides* (L.) Desf., Hallett's Cove. **Tragopogon porrifolius* L., Salsafy, near Fulham. **Scorzonera laciniata* L., Grange, Noarlunga (Oct.)—Previously recorded only from Collingswood in this State. *Picris hieracioides* L., var. *squarrosa* (Steetz) Benth., Hawkweed Picris, Fulham. **Sonchus oleraceus* L., Sow-thistle. **S. asper* Hill, Prickly Sow-thistle, Hallett's Cove, Port Noarlunga. *S. megalocarpus* (Hook. f.) J. M. Black, Grange. **Reichardia picroides* (L.) Roth, Grange.

ADDITIONS.

GRAMINEAE.—*Paspalidium gracile* (R.Br.) Hughes, south end of Hallett's Cove (Nov.). *Aristida Behriana* F.v.M., on travertine limestone, Marino, south end of Hallett's Cove, Nov. *Avena barbata* Brot., Bearded Oat, Nov.

ELLICEAE.—*Thysanotus Baueri* R.Br., also Hallett's Cove scrub, Nov. *Dichopogon fimbriatus* (R.Br.) J. M. Black, slightly scented, Hallett's Cove scrub, Nov.

Total species 459 and 2 varieties in addition, of which 155 are introduced and 304 and the 2 varieties are indigenous species.

NOTICE!

As the Society intends to publish a MEMBERSHIP LIST in the S.A. Naturalist, will Members kindly write to the Secretary or Treasurer as soon as possible, giving—

1. Full Name and Address:
2. Date of Election to Society:
3. Branch of Natural History in which they are interested.

SOUTH AUSTRALIAN SHELLS.

(Including descriptions of New Genera and Species).

(By BERNARD C. COTTON & F. K. GODFREY).

PART X.

FISSURELLIDAE.

Conical, limpet-shaped; with a hole in the centre, or with the front margin slit or notched; protoconch spiral, turned towards the hinder part where it forms a short and complete excentric spire, always in the young and mostly in the adult; muscular impression horseshoe-shaped, open in front. No operculum. Distribution—World-wide, but mostly in warm seas, from low water to moderate depths. Fossil—Carboniferous. Animal conical or semi-oval; mantle folded in front, forming a tubular process, which occupies a slit in the margin or near the summit at that end of the shell, or else a hole in the crown; head prominent, with a short muzzle; tentacles tapering; eyes on short tubercles, one at the outer base of each tentacle; gills paired, one on each side of the back, their free ends extending to the neck; foot thick, studded above or covered entirely with papillae; vent anterior, placed in the middle between the gill plumes. Sexes distinct. None of the *Fissurellidae* can properly be called littoral, although some are occasionally found under stones at low water mark. They are plant feeders. Outer layer of shell laminated, middle one cellular, inner nacreous. Protoconch spiral, although the adult shell assumes a conic form; in some genera there is a rudimentary spire in the young state, which disappears in the course of growth.

Scutus Montfort 1810 (= *Parmophorus* Blainville 1817; = *Scutum* of some others). Scutum, a large quadrangular shield. Oblong, depressed, protoconch directed backward; no anal groove or slit, but the front margin more or less truncated and sinuous; surface without radiating sculpture; anterior ends of the muscle-scar converging but not hooked inward toward the apex. Type—*Scutus antipodex* Montfort; = *S. ambiguus* Chemnitz. Shell partly concealed by the mantle; animal black or blotched with black, snout and tentacles long; epipodial row of papillae present. They are shy and avoid the light; they are found under boulders between tide marks. This Indo-Pacific genus represents the more primitive form of the family. The lack of radiating sculpture, smooth edge of the shell, and differently formed muscle-scar afford amply sufficient characters for the separation of the genus from *Emarginula*.

S. anatinus Donovan 1815 (*Patella*). Pl. 1, fig. 1. (= *S. astrolabens* Hedley; = *S. australis* Lamarck 1822; = *S. convexus* Quoy & Gaimard; *Patella elongatus* Blainville 1817; not *S. antipodis* Montfort 1810, the narrower Peronian form). Oblong, depressed, sides almost parallel, converging in front; ends rounded, the front end somewhat sinuous, not squarely truncated; buff or yellowish-brown; surface concentrically striated, not obliquely corrugated; protoconch at about the posterior fourth of the length; inside white, usually with some purplish or orange stains; muscle-scar distinct, rugose; there are usually some punctures at and behind the apex of the cavity. Length 85, breadth 45, height 11 mm. On rocks or in crevices.—Port Vincent, St. Francis Island, Edithburgh, Victor Harbour, Corny Point; dredged—Backstairs Passage, 15 fathoms. Also Western Australia—Rottnest, Yallingup, Ellensbrook, Bunbury, King George Sound, Esperance. (Type locality—unknown). *S. australis* Quoy & Gaimard is proportionately broader than the others. *S. convexus* Quoy has the side margins arcuate. The South Australian shells vary considerably in shape and size; four examples from Yorke Peninsula measure—78.5 mm. in length, 42.5 in width, 8 in height, and 20 mm. in distance of apex from margin, 100 x 53 x 18 x 27 mm., 113 x 71 x 19 x 35., 120 x 65 x 18 x 27 mm. The latter two are wide for their length, and are evidently comparatively old animals. The largest we have seen is 135 x 77 x 28 and 45 mm. distance of apex from margin, from Young Husband beach, 18 miles south of Murray mouth.

Tugali Gray 1845 (= *Tugalia* Gray, of authors). Oblong, depressed, protoconch posterior, front margin without a notch, either rounded or sinuous; no internal anal groove; no enlarged rib in front. Type—*Tugali elegans* Gray.

T. cicatricosus A. Adams 1851 (= *T. tasmanica* Tenison-Woods 1876; not *T. parmophoides* Quoy & Gaimard, a Peronian shell). Pl. 1, fig. 2. "The Scarred Tugali." Elongate oval, back much depressed; white; decussated with radiating riblets and concentric lines; protoconch subposterior, about one-third length of shell from anterior end, depressed, excavated, as if were scarred, subpellucid, base arched; margin or aperture crenulated, front extremity sinuate, sinus produced in a canal within. Length 38, breadth 25, height 10 mm. American River, Edithburgh, Corny Point, St. Francis Island, on rocks; Port Lincoln, alive on *Pinnae*; dredged—Backstairs Passage, to the westward, 9-20 fathoms. Also Western Australia—Esperance, Hopetoun, King George Sound, beach and down to 35 fathoms; not recorded from the western coast of Western Australia. (Type locality—Port Lincoln. Formerly erroneously ascribed to the Philippine Islands).

An average Flindersian specimen has straighter lateral margins, tapering anteriorly and spreading posteriorly, compared with Pilsbry's illustration. Recorded from Victoria and North Coast of Tasmania where it is said to be rare. Hedley suggests that the scar is caused by the adherence of a *Capulus* or some such association. From *T. parm-opholidea* (the New South Wales shell) *T. cecilioides* is more depressed, sides more parallel, protoconch nearer the margin, more strongly notched anteriorly, and sculpture much coarser.

Emarginula Lamarek 1801 (= *Semperia* Crosse 1867). "Slit Limpets." The genus name refers to a little notch in the margin. Oval, obliquely conical, the recurved protoconch directed backward; front slope with a deep incision in the margin; anal fasciole distinct extending upward from the fissure, sculptured differently from the other ribs of the surface; surface latticed; no septum or deck inside. Type—*E. conica* Lamarek 1801. Cap-shaped shells, with a vertical slit in front, which is partly filled up as the shell increases in size, so as to leave a furrow; protoconch always spiral; inside thickened on each side of the slit. The mantle of the animal protrudes from the slit, outside which it forms a short tubular process. Slit-limpets inhabit Europe, Asia, Africa, America, and Australasia. The very young resembles a *Scissurella*; the fry has no slit. *Emarginula* in the restricted sense, is a good location for *dilecta* Adams, *candida* Adams, *subtilitexta* Verrill, *patula* Cotton, *flindersi* Cotton.

Montfortula (subgenus) Hedley 1915. Oval, conical, protoconch subcentral; axial ribs numerous, raised, narrow, cancellated by many concentrics; margin crenulated; internal anterior groove distinct, ending in a notch. Type—*Emarginula rugosa* Quoy & Gaimard. *E. stellata* A. Adams, also belongs here.

E. dilecta A. Adams 1851. "The Beloved Emarginula." Elongate oval, subquadrangular, much depressed; summit sub-posterior, inclining backwards; white; decussated with subdistant radiating asperulate ribs, and elevated concentric lirae; base arcuate; margin of aperture denticulate, deeply fissured in front. Length 12, breadth 8.5, height 4.5 mm. All along the South Australian coast, not uncommon, beach and dredged to 110 fathoms. Also Western Australia—Hopetoun, Ellensbrook, Bunbury, and common at Rottnest. (Type locality—King George Sound, W.A.). Varies greatly, some very flat, others elevated; some have about twenty-four prominent ribs which project slightly beyond the base with intercostal riblets, in others the ribs are more nearly equal and are rounder and less scaly. One example from St. Francis Island is normal but has no slit at the end of its fasciole.

E. candida A. Adams 1851. "The Shining-white Emarginula." Elliptical, depressed-conic, oblique protoconch subposterior and inclined backwards; white; radiating riblets, scaly, alternately larger and smaller, interstices latticed; margin of aperture denticulate, deeply incised in front. Length 13, breadth 10, height 6 mm. All along the South Australian coastline, not uncommon; beach and dredged to 150 fathoms. Also Western Australia—Rottnest, King George Sound, Esperance, Barbury, Ellensbrook. (Type locality—Port Adelaide, on the sands). *E. candida* is more solid than *E. dilecta*, the ribs and concentric line fewer and stouter, the fissure not so deep, and a marked difference is in the manner in which this is filled up. In *E. dilecta* there is a prominent thin costa on each side of the fissure, and between these the shell is scalloped, convex upwards, about one scallop to two concentric lirae. In *E. candida* it forms a short raised rib.

E. subtilitexta Verco 1908. Ovate, rather thin; protoconch small curved, one sixth of length from posterior end; shell convex anteriorly from apex to margin; posteriorly concave below the apex, then convex, then somewhat spreading near margin; white; radial ribs, sixty, low, flatly rounded, half as wide as the interspaces, projecting beyond and crenulating the margin; concentric lamellae, narrow, erect, rather crowded, cancellate the surface; slit narrow, margined by a low thin erect lamella, posterior two-thirds closed, closing callus sunken and scalloped with transverse erect lamellae convex towards the apex; interior smooth and white. Length 6.5, breadth 4.9, height 1.4, fissure 1.4 mm. Dredged—Beachport, Cape Borda, St. Francis Island, 15-100 fathoms. Also Western Australia—Rottnest. (Type locality—110 fathoms, off Beachport, South Australia). *E. superba* Hedley has the same number of radial ribs and the dentate margin, but has higher concentric lamellae. *E. dilecta* A. Adams, has a singular sunken slit fasciole, and nearly the same number of radial ribs, rather more; but has ruder ribs wider than their interspaces.

E. patula Cotton 1930 (*E. superba patula* Cotton 1930). Pl. I, fig. 3. "The Spreading Emarginula." Shell large, elevated, oval; margin spread, widest at the lateral line of the apex, and attenuate anteriorly; exterior gray, with the alternate large ribs white and separated by one large and two small pinkish-brown ribs; fissure deeply slit; about sixty radial ribs, sharp, elevated, parted by narrow deep interstices in which arise secondary riblets; dense imbricating scales transverse both ribs and furrows; slit

fasciole elevated, two thin erect walls include fine close curved transverse scales; interior of fasciole marked by a heavy streak; callus. Length 19.3, breadth 14, height 5.6 mm. Beachport to Fremantle, down to 200 fathoms. (Type locality—Beachport, 200 fathoms). The margin spreads more than in the Peronian *E. suba*, being widest at the lateral line of the apex, and it is more attenuate anteriorly.

E. rugosa Quoy & Gaimard 1834 (= *Clypidina canāda* A. Adams 1851: — *C. angulata* A. Adams 1851: — *C. scabricola* Adams 1851: — *E. fangina* Gould 1846: — *C. acuminata* Adams 1851: not *E. conoides* Reeve, the Sydney shell, Pl. 1, fig. 5, "The Wrinkled Emarginala." Oval, conical, limpet-like, protoconch 5: central; whitish; primary ribs thirteen to seventeen, narrow, raised, continuing to the apex, each interval occupied by three small riblets; ribs cancellated by close, raised, concentric threads which form prickly scales where they cross the radiating ribs; interior greenish (or white), the area within the muscle-scar dark or outlined with dark green, usually distinctly mushroom-shaped; anal groove rather deep, not short. Length 17.5, breadth 13, height 8.5 mm. Not uncommon, on rocks and stones above low tide mark; Port Lincoln, Kingscote, Venus Bay, Seales Bay, Point Sinclair, Mirua Bay, Streaky Bay, MacDonnell Bay, Beachport, Grichen Bay; dredged Yankalilla Bay, 10 fathoms. Also Western Australia—Esperance, Ellensbrook, Yallingup, King George Sound, Hopetoun, Rottnest, where the largest specimen we have seen is 14.2 x 5.2 mm. (Type locality—King George Sound). The primary ribs not split or double, and sometimes some are suppressed on the side slopes; margin very finely crenulated, denticles 60 to 72; a mushroom is usually outlined in dark green or olive, in the interior; basal margins level, sides not arched upward, margin not noticeably thickened. There is a variant in which the ribs are subequal. The radula of the species is quite different from that of *Hemitoma submarginata* Blainville: the central tooth is serrated and the laterals small in *rugosa*; in *submarginata* the central tooth is not serrated and the laterals are comparatively larger. *M. conoides* Reeve = *Hemitoma aspera* Gould, the Peronian shell, from Caloundra (Queensland) to Lakes Entrance (Victoria) is not so tall as *M. rugosa*, apex is more central, anterior slope less arched, posterior slope not so steep and more spreading basally, sculpture coarser and less regular, and (especially in the northern forms) the coloration of the spatula is more marked.

E. stellata A. Adams 1851 (*Glypidina*). "The Star-like Emarginula." Solid, elliptical, depressed conical, protoconch subcentral, whitish; radiating ribs, elevated, subspinulose, interstices sharply roughened by close decussating striae and costellae; margin of aperture dentate, sinus sublateral, inside produced in a canal toward the apex. Length 7.5, breadth 4.5, height 2.5 mm. Dredged—Backstairs Passage, 22 fathoms, one dead. (Type locality—Australia). This species differs from *E. rugosa* Quoy & Gaimard, in the production of the ribs at their marginal termination, and the greater coarseness of the sculpture generally (Adams). In the Tate collection several shells are labelled *stellata*, which are probably only young *rugosa*.

E. flindersi Cotton 1930 (= *E. convexa flindersi* Cotton 1930), Pl. 1, fig. 4. "Flinders' Emarginula." Shell small, solid, sub-conical with a slight spiral twist, high arched, a narrow in-rolled depressed apex projecting beyond the base; posterior wall concave; aperture regularly oval, margin denticulate, sinus one seventh the length of fasciole which is continued to the apex as a groove, margined by narrow walls and crossed by bars; colour white; sculpture—about forty radial ridges set with beads which are joined concentrically by interstitial threads. Length 3.5, breadth 2.7, height 1.7 mm. Dredged—Beachport to Cape Jaffa, 130-150 fathoms. (Type locality—Off Cape Jaffa, South Australia, 130 fathoms), from *E. convexa* Hedley 1907, cotypes from Mast Head Island, Queensland.—South Australian examples of *E. flindersi* are more spreading, and the radial ribs are fewer and wider apart. *E. convexa* is steeper and narrower. Juveniles are much alike, and *E. flindersi* does not appear to spread until approaching maturity. Most of our shells are a little larger than the *convexa* cotypes supplied by Hedley.

Hemitoma Swainson 1840 (= *Monfortia* Recluz 1843; = *Schicorella* Issel 1869). Pateliform; the fissure not cut through the shell, but merely forming an internal groove, with a corresponding external rib running from the middle of the anterior margin, where there is an upward loop of the peristome. Type—*H. striatata* Swainson.

H. submarginata Blainville 1819 (= *Loricopora australis* Quoy & Gaimard 1834; = *E. tasmanica* Sowerby), Pl. 1, fig. 10. Shell ovate, conic, inflated, whitish; sculpture coarse, radiating, striae alternating thick, rugose and small; vertex median, obtuse, re-tracted; margin undulating. Sculpture and shape very variable. Length 28, breadth 20, height 18 mm. Gulf St. Vincent, deep water. (Type locality—Australia). Edithburgh and Guichenot have a few large dead shells.

Cosmetalepas Fredale 1924. Referring to the shell described by Crosse & Fischer 1864 as *Fissurella concatenata*, Fredale writes:—"This peculiar form appears almost unchanged in South Africa, the shell found there being still called by Crosse & Fischer's name, given to a South Australian species. Tenison-Woods has also recorded it as fossil, noting a slight difference between the fossil and recent shells, and also between the New South Wales and South Australian shells. It is therefore obvious that its peculiarities are of genetic importance, and I propose the new generic name *Cosmetalepas* with Crosse & Fischer's species as type." It is to be regretted that Fredale does not more clearly define the genus or indicate its affinities. We include it here as the present as the type species is South Australian, and the description of *Cosmetalepas concatenatus* Crosse & Fischer 1864 must suffice for the genus.

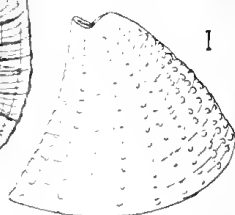
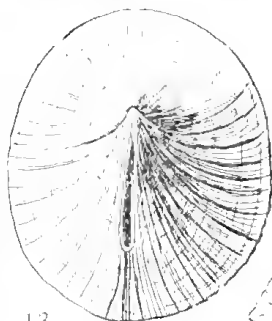
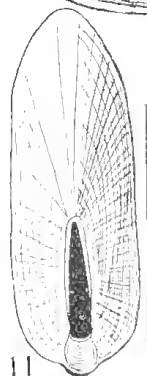
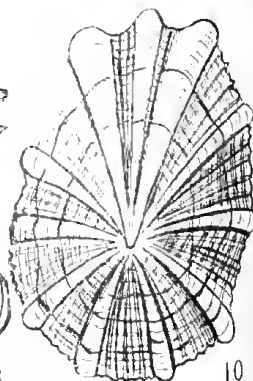
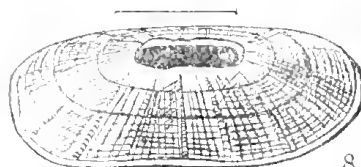
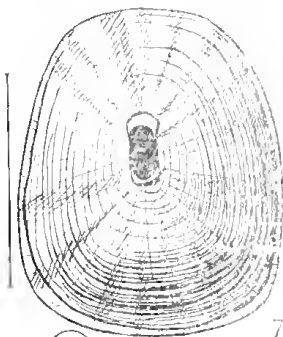
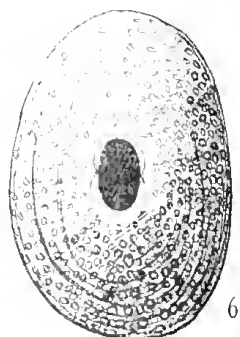
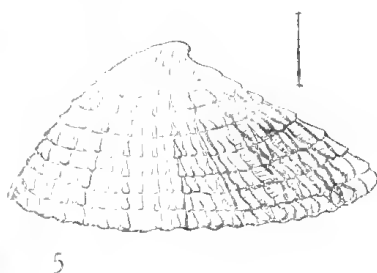
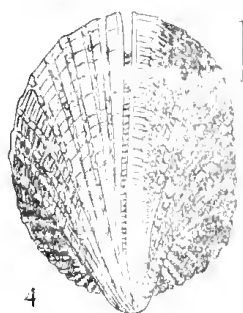
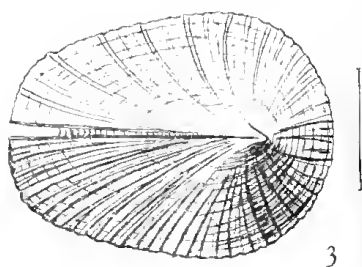
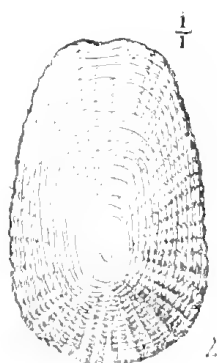
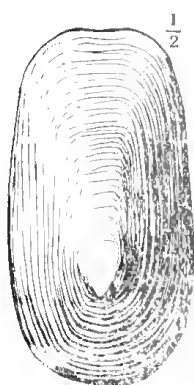
C. concatenatus Crosse & Fischer 1864, Pl. 4, fig. 6, (*Fissurella*). Oval, depressed, rather thin, without radiating ribs, very slightly compressed laterally; outer sculpture all over, with an elegant pattern of little rounded pits (like a thimble), becoming oval near the margins; perforation large, oblong, a little over one-fifth the length of the shell, inside with a narrow callus rim around the perforation; muscle impression not impressed, close to the margin. Length 15, breadth 10.5, height 3.5 mm. Generally distributed in South Australian waters, rather uncommon, beach and dredged to 150 fathoms. Under foul stones below low tide in association with a grey ascidian, Outer Harbor, Corny Point. Also Western Australia—King George Sound to Bunbury, beach to 55 fathoms. (Type locality—Port Lincoln). The network of rounded hollows much resembles the work of one of the *Byssa*, or of a Polyp, although it is really shell sculpture. Fissure subcentral, very slightly narrowed in front and strongly marginated inside. Very rarely there may be about twenty narrow light brown radial rays (or opaque white rays), also the white callus round the hole inside may be surrounded by smoky brown from which brown flames, becoming narrower, extend outward, not quite to the border.

Amblychilepas Pilsbry 1890. Large fissured *Fissurella*, with a saddle-shaped shell, elevated at the two ends, its margin thickened, blunt, not crenulated and without a white border on the abaxial; perforation oblong or oval, subcentral. Type *Fissurella traversina* Sowerby, 1834. *F. jayachensis* Lunarek, P. 1, fig. 7.

A. javanicensis Lamarek 1822 (*Fissurella*) (= *F. trapezina* Sowerby 1834; = *F. scutella* Gray; = *F. tasmaniensis* Bonnet 1864; not *Patella scutellum* Gmelin., from Cape of Good Hope). Pl. 1, fig. 7. Short, quadrate, angles rounded, fissure a little in front of the middle, rather large, elliptical, one fifth the length of the shell or a little more; light fawn tint, rayed with brown; concentric striae fine, regular, more obvious than the radiating ones. Length 25, breadth 20, height 7 mm. Uncommon. Beachport to Hardwicke Bay, beach and dredged to 24 fathoms. Also Western Australia—King George Sound, Esperance beach. Lamarek gave Java as type locality in error. Shells from Guichen Bay, South Australia are typical, so this may be taken as the type locality. The outline is unusually square in adult shells (but the half-grown are oval, the front margin being abruptly truncated, and strongly arched upward). The posterior end is broadly rounded, and also a little curved upward. Surface sculptured all over with very fine and regular concentric striae, decussated by equally fine radiating striae, scarcely visible except near the summit. Colour—fawn or cream, with rays and radiating lines of light brown. Inside of a rather soiled white, the perforation bordered by a strongly defined callus, which is bounded by a roughened tract. Muscle impression very deep, close to the edge of the shell, its enlarged anterior extremities connected by roughened scar. Edge of shell blunt.

A. omicron Crosse & Fischer 1864 (*Fissurella*). Oval, depressed; radiating ribs, crossed by fine concentric striae, especially developed towards the summit, and giving that part of the shell a granular appearance; intervals between ribs occupied by radiating striae; inside smooth, shining, bluish-white; margin simple, acute; fissure oval, bordered white. Length 13, breadth 10 mm. Rare. Beach—Hardwicke Bay, Denial Bay; dredged—Port Lincoln, Investigator Straits, Wool Bay, St. Francis Island, 9-35 fathoms. Also Western Australia—beach, King George Sound, Bunbury, Geraldton. Crosse & Fischer in 1864 gave Spencer Gulf as the type locality, and in 1865 altered this to Gulf St. Vincent. Colour of shell generally a slate-blue tint, but it may be yellow, pink, speckled black, or whitish; around the perforation it may be white which may run in rays to margin at front and back, and sometimes for a little distance down a riblet at the sides, or articulate several ribs; it may be greyish-white dotted with black, or with a few broad reddish radial bands, or the ribs may be white and the interstitial riblets articulated with





EXPLANATION OF PLATES.

PLATE I.

- Fig. 1—*Scutus anatinus* Donovan.
- Fig. 2—*Tugali cicatricosus* A. Adams.
- Fig. 3—*Emarginula patula* Cotton.
- Fig. 4—*Emarginula flindersi* Cotton.
- Fig. 5—*Emarginula rugosa* Quoy & Gaimard.
- Fig. 6—*Cosmetalepas concatenatus* Crosse & Fischer.
- Fig. 7—*Amblychilepas javanicensis* Lamarck.
- Fig. 8—*Sophismalepas nigrata* Sowerby.
- Fig. 9—*Austroglyphis lincolnensis* Cotton.
- Fig. 10—*Hemitoma submarginata* Blainville.
- Fig. 11—*Macrochisma producta* A. Adams.
- Fig. 12—*Zeidora tasmanica* A. Adams.
- Fig. 13—*Puncturella corolla* Verco.
- Fig. 14—*Puncturella fumarium* Hedley.



bluish-black spots, or with a cream foundation there may be a few broken concentric bands of translucent amber brown. A specimen dredged off St. Francis Island shows brown rays in the hollows between the undulations, composed of brownish radially elongated flecks disposed angularly in broken arrowheads, very closely set at the summit of the shell, and relatively distant near the margin. The typical sculpture consists of about twelve prominent equidistant radial ribs, with four riblets in the inter-stria spaces but there may be only numerous radial equal striae, and these may vary in different specimens, in size and number, and in some may be very fine; one example, dredged off St. Francis Island, has about thirteen invalid axial undulations with very crowded axial incisions. When dredged and not beach rolled, the ribs and riblets are beset with stout crowded somewhat irregular tubercular scales. Quite common in King George Sound, both on the beach and in moderate depths, much more common along the South Australian shores, or in the dredgings.

Sophismalepas Iredale 1924. Oblong-oval, with a large oblong subcentral perforation which is surrounded inside by a narrow marginal callus; radially striated; both extremities elevated. Type—*Fissurella nigrina* Sowerby 1834. Iredale states that Hedley transferred the Australian species (*nigrina*) from *Macatebenia* Pilsbry to *Lucapirella* Pilsbry, from study of the animal, but, with our present knowledge of this group, the observed differences were quite sufficient to separate the Australian shell generically. Hedley gave a figure of the radula of his new species *L. pilchardi* and the radula in the Gwadeloupe Collection, labelled *L. nigrina*, confirms this; i.e., the central tooth is degenerate and pear-shaped, the inner laterals with short somewhat blunt cutting edges, the large outer lateral strongly tricuspid; the marginals being comparatively few and simple showing no cusps. In *Lucapirella* Pilsbry the central tooth is large and rhomboidal, the inner laterals are similar to those of the preceding, but the cutting edges are more pronounced, while the outer lateral is bicuspid, the third cusp, if present, being very minute and not recognisable, while the marginals are many and notably cuspidate.

S. nigrina Sowerby 1834 (*Fissurella*), Pl. I, fig. 8. Oblong-oval, depressed, both extremities decidedly elevated; the orifice nearly central or a little behind the middle, large, oblong, nearly one-third the length of the shell; dark brown, obscurely rayed with darker; radial striae, fine; growth striae, uneven; inside bluish; orifice surrounded within by a narrow marginal callus; shell edge blunt, smooth. Length 14, breadth 9.5, height 4 mm. Not

common; from MacDonnell Bay to Fremantle beach, and dredged to 35 fathoms. (Type locality—Southern Tasmania (Tredale)). This species is very variable. Flindersian specimens are usually thicker, shorter, and wider than the type, but a large series shows that they merge into the typical form. The ribs may be all of the same size or there may be about fourteen radial ribs which stand higher than the rest, with about seven small ones between. The larger ribs may be double or may become devaricate. They are of a lighter colour than the rest of the shell which is blackish or rusty brown. For some distance around the perforation the shell may be white, bordered by an almost black scalloped edge which fades off to the usual colour of the shell. There may be a pinkish encircling band on the dorsum just within the margin. A juvenile is of a greenish tint with four double blackish radial bands at the four angles of the shell.

Animal active; foot and mantle rose, papillae on foot and mantle white, coronal processes white, sole yellow, snout brown, tentacles and anal tube orange, a few papillae along the shell black; foot, more than twice the length of the shell, bearing numerous papillae of various sizes; tentacles subcylindrical, tips blunt, half as long as the shell, with conspicuous eyes on outer bases; snout half the length of tentacles, slightly tapering, oral edge longitudinal; anal tube sometimes exerted, surrounded by cushion-like papillae; mantle roughened and denticulated on both margins by numerous small papillae; outer margin free all round, capable of sheltering the retracted head and falling curtain-wise from the shell's periphery to the foot; inner margin not overlaying the shell, produced into sixteen erect, branched, waving processes which surround the shell like a crown; viewed from above these coronal processes give the whole animal the general aspect of a sea anemone.

S. oblonga Menke 1843 (*Fissurella*) (= *Lucapinella pritchardi* Hedley 1895). Shell oblong, twice as long as broad, parallel sides, ends rather abruptly rounded, slightly pinched on either side of the perforation, posterior end suddenly and highly, the anterior gradually and slightly elevated; middle edge of shell somewhat arched; perforation narrowly oval, a quarter of the shell's length, its anterior end the shell's centre; pink, obscurely rayed by half a dozen yellow segments; interior white, smooth, porcellaneous, except at short edge where it is pink and crenulated by the external riblets; notch cut deepest at hinder end; riblets, radiating, unequal, about ninety, broader than interstices, beaded where cut across by circumferential growth lines, near the margin this sculpture develops into imbricating scales upon the riblets; posteriorly the edge bordered within by a heavy callus, which

gradually thins out about the middle of each side; perforation also surrounded by a callus. Length 24, breadth 12, height 5 mm. Not common; beach, McDonnell Bay, Robe, Port Willmer, Pondowie Bay, Seales Bay, St. Francis Island. Also Western Australia—beach, Albany, Yallingup, Ellenbrook, Bunbury, Rottnest, and dredged, to 35 fathoms. (Type locality—Flinders, Victoria). Of many examples regarded as *oblong* in Marke, from Western Australia, the largest measures 22.1 x 13.7 x 6 mm, the slit 5 mm. long, 3.2 breadth; hole almost exactly central.

Macrochisma Swainson 1840 (= *Macrochisma* of most authors). *Fissurellidae* with an oblong shell not at all covered by the mantle, and much shorter than the long fleshy foot; its apex near the posterior margin, wholly removed by a large subtriangular fissure the wider end of which is very close to the posterior end of the shell. The shell is situated on the front part of the body, the mantle extended a little in front of it. Tentacles long, subulate, the eyes on slight swellings at their outer bases. Equidistant ridge wholly obsolete. Anal tube rather long, directed backward. Type—*M. hiatula* Sowerby. Distribution of genus—Indo-Pacific and from Tasmania to Japan. The more obvious characters are the large fissure close to the hinder end of the shell, margined inside by an entire narrow callus, and the posterior position of the vertex.

M. producta A. Adams 1850. "The Prolonged Macrochisma." Pl. 1, fig. 11. Narrowly oblong, back elevated, convex; white, variegated with pale brown or pink; obscurely decussated with elevated lines and concentric striae; anteriorly narrow, produced, with planulate sides; posterior extremity rounded, elevated; margin deeply sinuated; fissure very long, triangular, dilated posteriorly. Length 28, breadth 10, height 6.5 mm. Backstairs Passage, Normanville, Yankalilla Bay, American River, Edithburgh, Hardwicke Bay, Pondowie Bay, Beards Bay, beach and dredged to 20 fathoms, uncommon. Also Western Australia—King George Sound, Albany, Rottnest, Hopetoun, Bunbury, Geraldton, on beach, uncommon. (Type locality—Port Lincoln). From *M. tasmaniae* Sowerby, this species is narrower, more vertical sides, fissure narrower and longer, resulting in a corresponding projecting curve on the periphery of the aperture; sculpture finer.

M. tasmaniae Sowerby 1866 (= *M. tasmanica* Tenison-Woods 1875, afterwards changed to *M. goldii* Tenison-Woods 1876). Oblong, length nearly double the breadth, elevated, attitude one-fourth to one-third the length, lateral margins somewhat convex; whitish, obscurely concentrically clouded with

yellowish, and having riblets at intervals, speckled with brown; radial ribs made irregular by irregular growth wrinkles, anterior ribs alternately large and small. Length 27.5, breadth 14, height 8 mm. Generally distributed but uncommon, from McDonnell Bay, South Australia, to Bunbury, Western Australia, beach and dredged to 15 fathoms. (Type locality—Tasmania). The peristome curves strongly upwards posteriorly, and this end is more bluntly broadly rounded than the other. Front end not curved upwards, the radiating riblets are much stronger on long anterior slope, and alternate with much smaller ones. The orifice is on the posterior slope, which is below is broadly eroded, erosion not extending to posterior edge of shell. Inside white, except tract on each side and in front of fissure which is pink. Fissure twice as long as its greatest width, surrounded by a callus, wide except on the back margin. Muscular impression narrow, deeply impressed.

M. roseoradiata Tenison-Woods 1876, A coloured variant having numerous rose-coloured rays. Uncommon, on beach, St. Francis Island. Tenison-Woods introduced this as *Macrochisma zeldii* var. *roseo-radiata*.

Austroglyphis gen. nov. Shell comparatively large, beautifully sculptured by prominent radials, larger posteriorly, crossed by concentric laminae forming distinctive, elevated, digitate scales at the intersections; internal callus surrounding the perforation truncate posteriorly; externally the perforation is rectangular, almost square, corners rounded, each of the four sides bulging inwards at the middle. Radula formula 1.4.1.4.1, consists of a wide central tooth set obliquely on the radula; four very narrow laterals; one large major lateral having two cusps, the under and larger much stronger than the upper; an indefinite number of very narrow marginals attached to a base which is apparently folded. (Type—*Diodora lincolniensis* Cotton 1930). Distinguished from *Eligidium* Iredale by the sculpture and truncation of the internal callus of the perforation.

A. lincolniensis Cotton 1930 (not *Fissurella jukesii* Reeve 1849, from Queensland). Pl. 1, fig. 9, "The Port Lincoln Austroglyphis." Ovate, wider posteriorly, elevated, conical; posterior slope convex, anterior slightly concave; perforation rectangular, small; yellowish, radials tinged with brown, depressions caused by latticed sculpture blue; radial ribs, eighteen, prominent, larger posteriorly, with one smaller interstitial between the twelve anterior, and two between the posterior; concentric laminae, eighteen, cross the radials, forming digitate scales at intersections; internal callus, surrounding the perforation, truncate posteriorly. Length 41, breadth 29.2, height 18 mm. Not common, Newland Head, Backstairs Passage, Brighton, Investigator Strait, Corney

Point, Port Lincoln, Laura Bay, Murat Bay, beach and dredged to 20 fathoms. Also Western Australia—Albany, Yallingup, Ellenbrook, Bunbury, Shark's Bay, beach to 22 fathoms. (Type locality—Port Lincoln, South Australia). A beautifully sculptured form. A large beach worn specimen from Port Lincoln measures 60 x 40 x 25 mm. This species somewhat resembles the Queensland shell *F. jukesii* Reeve, but is far more ornately sculptured.

Zeidora A. Adams 1860 (= *Zidora* Fischer; = *Crepidomargicula* Seguenza; = *Legrandia* Beddome 1882). Oblong, depressed, protoconch recurved, posterior; fissure an open slit in the front margin; interiorly provided with a flat semilunar septum like *Crepidula*; surface cancellated; front slope grooved by a slit fasciole having elevated edges. Type—*Z. calceolina* A. Adams (Japan). This genus is distinguished from all other *Fissurellidae* by the internal shelf.

Z. tasmanica Beddome 1882 (*Legrandia*) (= *Zidora legrandi* Tate 1894), Pl. I, fig. 12. Oval, radiately ribbed; front edge fissured; interior with a shelly plate extending one-fourth the length of the shell. Length 5, breadth 3, height .75 mm. Rare; Venus Bay, Corney Point, beach; 35 fathoms west of St. Francis Island; Backstairs Passage 7-20 fathoms. Type locality—Kelso Bay, Tamar River, Tasmania, 17 fathoms). Beddome's description (above) is severely brief. Because of this and the absence of actual specimens for comparison, Tate described *Z. legrandi*, at the same time remarking "there is presumptive evidence that the two shells belong to one species." The following is Tate's description—depressedly conical, cap-shaped, delicate, elliptic-oblong in basal outline, rounded behind, truncately rounded and deepy cleft in front, with a narrow sunken fissural band extending to the apex; back depressedly convex; white; radial threadlets, oblique, and concentric threadlets, produce a cancella-tion of rhombic spaces; margin of aperture, closely crenulate-serrate; fissural band margined on each side by an elevated rounded keel, which is crenated; scars on fissural band, arched, sharp, close but not contiguous; protoconch minute and short, hooked and somewhat adpressed, almost reaching the posterior margin; inside glossy, smooth; septum narrowly crescentric (extending in middle line to about one-fifth and on sides one-fourth of length of aperture), much depressed posteriorly (about one-half depth of shell) becoming shallower on anterior border. Length 9.5, breadth 6, height 2, depth of cleft 2 mm. Juveniles have the protoconch projecting beyond the periphery, which is a distinguishing feature of *Z. lodderae* Tate and May, from Tasmania, but no mature South Australian specimens are referable to that species.

Puncturella Lowe 1827 (= *Cemoria* Leach M.S., 1819; not *Cemoria* Risso 1826; = *Sipho* Brown 1827; = *Tacirra* Iredale 1924). Small, conical, having a spirally recurved protoconch either persistent or absorbed in the adult; fissure either lanceolate or oval, on the front slope or at the summit of the cone; inside there is a plate extending forward forming a conduit to the fissure or a deck over it. The spiral protoconch is inclined toward the right side, and the fissure is also a trifle to the right of a median line, when visibly excentric; the surface usually shows minute granules under a strong magnification. Type—*Patella nouaequina* Linne 1771. (Circumpolar—Scotland to Northern Japan). Mainly a deep sea group. It differs from *Emarginula* in having a septum or deck inside; from *Zeidora* in having the fissure closed, not an open anterior slit.

Rimulanax (Subgenus) Iredale 1924. Iredale limits his remarks on this subgenus as follows:—"The species classed as *Puncturella* are of different sizes, simply agreeing in being conical, and in the possession of an internal shell. The deep-sea forms known as *Granopsis*, such as *Rimula asturiana* Fischer 1882, are represented in Austral seas by the magnificent *Puncturella corolla* Verco 1908. This group I name *Rimulanax*, with *P. corolla* as type."

Fissurisepta (Subgenus) Seguenza 1863. *Fissurisepta* is an erect, conical *Puncturella* in which the short oval fissure has wholly absorbed the apex; the internal septum is well developed; there is no radiating sculpture, the smoothness of the surface being broken only by tiny tubercles or granules, which are better developed in species of this section than in the more coarsely sculptured. Type—*F. papillosa* Seguenza 1863 (North Atlantic). *Puncturella tumarum* Hedley belongs here.

P. harrisoni Beddome 1882 (*Cemori*) (= *P. henniana* Brazier 1894). "Harrison's *Puncturella*." Ovate, conical; surface sculptured with radiating ribs; protoconch subspiral, recurved posteriorly; perforation narrow, oval; interior with shelly plate half covering the perforation. Length 4, breadth 2.75, height 5 mm. MacDonnell Bay, beach. (Type locality—off Old Station, Brown's River Road, 7 fathoms, Tasmania).

P. corolla Verco 1908 (*Puncturella*). Pl. 1, fig. 13. "The Crown *Puncturella*." Thin, roundly oval, depressed conic; apex excentric, at the posterior fifth, spiral, well curved backwards; protoconch projects on right side and consists of two whorls, the first turn-and-a-half smooth, convex, glistening; second half turn, which increases rapidly, is minutely crowdedly granular; at junction of the two is a minute scar, the first part fitting into the second; in adult shell the latter part of protoconch looks directly backward; sculpture of shell begins gradually as accretional

wrinkles, next as radial riblets; where wrinkles commence the slit begins; dorsum in front is a uniform convex curve, behind it a continuous concave curve; perforation occupies the middle third of dorsal slope, and is lanceolate; between it and the protoconch its previous site is closed by a sunken lamina with subdistant erect transverse lamellae, convex posteriorly; between it and the anterior margin is a differentiated rib, broader and higher than the rest, fissured superficially throughout; in its upper part the fissure is as wide as the perforation, but nearly closed internally by 1 horizontal laminae from the sides; it gradually contracts anteriorly to a fine line; in its upper half the fissure communicates with the interior, in the lower it is shut off; slit fasciole and perforation are bounded on each side by a delicate erect lamina, highest at perforation, in front of which the laminae gradually approximate to form the differentiated rib; from protoconch to margin this lies a little to right of actual median line of shell; radial ribs, well rounded, nearly smooth, about as wide as their interspaces, sixteen primary, increasing by intercalation of secondary and tertiary riblets to ninety in a shell of ten millimetres length, and crenulating the margin; posterior ribs broader, closer; internally a small shelf or septum convex towards the interior, with a sharp simple margin anteriorly hides the upper fourth of the perforation, being attached to shell at a distance from margin of perforation about equal to width of perforation, it gets gradually narrower and less obvious posteriorly; its dorsal surface slopes up to the slit fasciole; from perforation anteriorly runs a gutter to the margin; in older examples this becomes a thin central ridge; with age the shell grows more rapidly posteriorly, so that apex gets less eccentric, and the back part becomes very flat and sloping. Length 18, breadth 15.4, height 4.7 mm., apex 5.4 mm., from posterior end. (Type locality—150 fathoms, off Cape Jaffa, South Australia). Also 300 fathoms, Cape Jaffa. Different individuals display the varied aspects at successive stages, first a depressed spiral shell with a simple aperture; then an emarginula-like form, with a slit and slit fasciole; then a rimula-like shell, with a perforation just above the margin, continued as a narrow fissure to the border, and finally with the fissure closed and the perforation complete.

P. fumarium Hedley 1911 (*Puncturella*). Pl. 1, fig. 14. Shell laterally compressed, thin, translucent, erect, posterior profile usually slightly convex and anterior slightly concave; delicate concentric growth lines, small tubercles, conspicuous in profile, are set in radial rows; summit irregularly notched, subcircular seen from above, cleft with a short, steep posterior limb seen

from the side, the spiral apex disappearing from half grown specimens: septid plate deeply inserted, nearly perpendicular. Length 2.15, breadth 1.35, height 1.85 mm. (Type locality—Several specimens from 100 fathoms, 40 miles south of Cape Wiles, South Australia. "F.L.S. Endeavour.") The first recorded representative of subgenus *Physuribepta* in Australasia.

ENTOMOLOGICAL CLUB OF SOUTH AUSTRALIA.

The inaugural meeting of this Club was held in the rooms of Dr. R. H. Pulleine on April 20th, 1933, when the following officers were elected:—

President—Dr. J. Davidson.

Secretary and Treasurer—Mr. H. Womersley.

Committee—Mr. J. W. Evans, together with the President and Secretary.

Auditor.—Dr. R. H. Pulleine.

During the year, seven monthly meetings have been held on the third Thursday of each month. At these meetings the following interesting exhibits and notes were amongst those brought forward.

April 20th—The Secretary showed specimens of a littoral species of Collembola *Neachorutes glauerti* Wom. (? *Pseudanurida billitonensis* Schott) taken by Mr. Hale at Willunga. A living specimen of the large Trap-door Spider (*Selenocosmia stirlingi* Hogg.) was shown by Dr. Pulleine from Wilmington. During a short paper on the arthropod fauna of the soil the Secretary exhibited specimens of the European Microthelyphonid *Koenenia mirabilis* Grassi found in garden soil at Glen Osmond.

May 18th—The Secretary showed a case of Tse-tse Flies from Africa. Mr. J. W. Evans exhibited a microscopic slide of a species of Thrips, some specimens of which contained the triungulin larva of a species of *Perilampus*, a minute Hymenopteron. Mr. Evans also gave an interesting account of the insects (a species of fly belonging to the genus *Fergusonia* Malloch, *Agromyzidae*) primarily responsible for the galling of the flower buds of Eucalypts.

June 15th—Living specimens of Protura and of *Japyx Tillyardi* Silv. were shown by Mr. D. C. Swan. The Linguatulid Worms, probably degenerate Acanthina, were described by Prof. Harvey Johnston and their occurrence discussed.

July 20th—The aquatic Hemiptera (*Cicadaria*) were shown by Mr. Hale and their habits discussed and illustrated by means of lantern slides. Mr. J. W. Evans brought forward specimens of Cicadas including the prehistoric non-stridulating species of *Tettigarcta*.

August 16th—The interesting Trombid Mite, *Chyrodia mayraci* Hirst, and the rare Polyxenid Myriapod, *Scoecurus acantho-hollandica* Silv., the first from Woodside, the other from Glen Osmond, were shown by the Secretary.

September 21st—Dr. Pulleine gave a talk on Spiders, dealing in detail with the various families. A very fine photograph of the fossil insect *Lemnatophora typica* Sell. (*Protoperlaria* Tillyard.) from the Kansas Beds.

October 19th—The Entomological Laboratories of the Waite Institution were visited and the various researches in progress were explained by Dr. Davidson, Mr. Evans and Mr. Swan.

November 16th—Mr. N. B. Tindale exhibited the Malacological material of the Hepialid Moths and detailed his studies of the Oncoptera and other groups of these moths. The Secretary showed specimens of the Australian species of Japygidae.

TWO NEW GENERIC NAMES FOR SOUTH AUSTRALIAN MARINE MOLLUSCA.

By TOM IREDALE.

(Contribution from the Australian Museum, Sydney, N.S.W.)

Recently some molluscs trawled off the New South Wales coast necessitated comparison with species of the genera allied to *Amoria* and *Hindsia*, and the opportunity offers for the recognition of the good work being done in connection with South Australian Mollusca by Messrs. B. C. Condon and F. K. Godfrey.

Genus **COTTONIA** nov.

Type *Scaphella darwini* Verco.

A genus of the Volutidae (*sensu latissimo*) large, thin, elongate oval, large apex, deciduous at an early stage, two or three whorls remaining, outer lip thin, fragile, columella with three long pleats.

When Verco (Trans. Roy. Soc. South Aust. vol. XXXVI, 1912, p. 225, pl. XIII, figs. 1, 2 (in colour), December: 105-77) bathons 90 miles West of the meridian of Eucla) described this very fine shell he overlooked *Voluta nodiplicata* Cox (Proc. Malac.

Soc., (Lond.), vol. IX, p. 146, pl. III, June, 1910) from Rottnest Island, West Australia, and these two have since been regarded as conspecific. Cotton and Godfrey used Cox's name and placed the species under *Alcithoe*, but the typical species of that genus is smaller, the shell more solid, the outer lip strong, and has a very small persistent apex, a character of great importance. Compared with the Rottnest shell, the present species is comparatively narrower, the nodules stronger, and it should be kept separate until more Western shells are available. These may be related to such fossils as *Voluta alticostata* Tate and *V. heptagonalis* Tate.

Genus GODFREYENA nov.

Type *Gominella torri* Verco.

A genus of the Buccinidae (*sensu latissimo*), medium size, elongately fusiform, spire long, canal short and strongly recurved, outer lip thickened but not variced, columella without pleats.

This species was first described from immature shells, collected at St. Francis Island, under the generic name *Gominella* (Trans. Roy. Soc. South Aust., vol. XXXIII, 1909, p. 271, pl. XXI, figs. 9-11, December). When beautiful adult shells were trawled in 77-105 fathoms, about 40 miles west of the meridian of Eucla, Verco (Trans. Roy. Soc. South Aust., vol. XXXVI, 1912, p. 220, pl. XIII, figs. 3, 4 (in colour), December) transferred the species, with doubt, to *Nassaria*, and Cotton and Godfrey have continued this allocation. Actual comparison with specimens of the genus *Hindysia* (= *Nassaria olim*) negative the association, the characters of the mouth being essentially different, while the canal and apex are also distinctive. As a matter of fact the genus may still be found to be more closely related to *Gominella* (*sensu lato*) than to any other Australian group.

DONATION.

Dr. D. G. Torr, of Brighton, has kindly sent along one guinea as a gift towards the publication of the part on South Australian Shells in this issue. This is the only financial support now being received for the book on Shells beyond that of the Field Naturalists' Society.

NOTES ON *CALADENIA LATIFOLIA*, R.BR.

By HAROLD GOLDSACK.

In his Presidential Address before the Botanical Section of the Australian and New Zealand Association for the Advancement of Science, August, 1932, Dr. R. S. Rogers writes concerning the pollination of orchids as follows: "The numerous devices to secure the application of the pollen to the stigma are often very elaborate, indeed, in certain cases they may be regarded as almost human in their ingenuity. Whenever the transfer is effected by insect agency, there is always payment for services rendered. This generally takes the form of nectar or pollen, but sometimes the nature of the currency is obscure. Great resource is displayed by the orchid in catering for the comfort and convenience of its visitors. Guide lines and other directionary signs, platforms and adaptations of various kinds are all generously provided for the needs of special insects. The mechanism is as far as possible fool-proof and as remuneration only follows a successful transfer there is no incentive for unskilled operators to frequent these flowers. The adaptability of this highly specialised family is very surprising. Obsolete or superfluous structures disappear, and the mechanism wherewith to meet new or altered conditions is merely a modification of existing parts."

When we study the genus *Caladenia* we are very forcibly impressed with our lack of knowledge concerning the payment which the insects, that visit the various species, receive. Up to the present time the pollination of two species is all that we know about the visits of insects to this large genus, which, it might be mentioned, contains about 75 species.

The first purposeful visit to be described was that of a black wasp-like insect to *Caladenia Barbarossa* Reichb. fil. by Sargent in 1907. These insects were observed to suck a sweetened juice from the conspicuous central callus on the labellum and while thus engaged performed the act of pollination for the flower. The next species to be observed during pollination was *Caladenia deformis* R.Br. This was recorded by Rogers in Trans. Royal Soc. S.A. for 1931. In this case the actual payment to the insect was not observed, owing to the structure of the flower which renders observation difficult, but it was suggested that the reward might be a sweetened drink from the large colourless basal calli on the labellum. This orchid, though small, has a bright blue flower and adds to its attractiveness with a sweet though not very strong perfume.

The larger species such as *Caladenia dilatata* R.Br. and *Caladenia Patersonii* R.Br., have little scent and show no signs of nectar; to our eyes they seem to rely solely on their bizarre

shapes, tremulous labella and bright colours in attracting insect visitors. No doubt the insect, when once persuaded into visiting the flower, would find some recompense for its trouble, even though its hopes of obtaining pollen from the yellow glands at the base of the column are vain and the glitter of the calli in the labellum is no warrant that they contain nectar. Perhaps this open invitation to all insects is the cause of the large number of hybrid forms which we find among the larger species of *Caladenia*.

At this stage it might be interesting to quote some notes on the senses of insects by H. Womersley, the entomologist of the S.A. Museum. In an article in the "Advertiser," he states that the honey-bee can distinguish blue but is blind to red; it can distinguish yellow, but is unable to differentiate it from orange or yellow-green; similarly they turn to blue-violet or purple alike. When we couple to this imperfect colour sense the well-known fact that insects perceive movement much more clearly than they do form, we no longer wonder at the frequency of natural hybridism among the large-flowered *Caladenias* which strangely enough wear the colours that bees would most likely misjudge, namely reds and yellow-greens.

In many orchids we find some factor which has a limiting effect on the type and size of insect visiting it. We are reminded of that native of Madagascar, *Ingravum sesquipedale*, which has a nectary of enormous length and can be visited only by moths with very long proboscides. In one of the orchids mentioned above, namely *Caladenia deformis*, the size of the insect is definitely limited. An insect too large would be unable to enter far enough to reach the desired tissues while an insect too small would not be strong enough to lever the labellum outwards to enable it to enter. Thus we find in many cases certain species of insects have become the regular associates of certain orchids.

Certainly there are exceptions, such as the case of the large *Caladenia* species. An article by E. E. Pescott in the September 1933 issue of the Victorian Naturalist has a very interesting paragraph on some such hybrid forms. Even while writing these notes I found a flower which was almost certainly a cross between *Caladenia reticulata* and *C. dilatata*.

All this suggests that various insects are concerned with the pollination of these larger species of *Caladenia* and that, although each may favour one species of orchid, it is easily lured away from that form by the bright colours, or rather the similarity of colours, of another large species.

It is with a feeling of relief that we turn to a species in which we can find a definite item of attraction for insect visitors and a flower which by its shape is able to select with a fair degree of

accuracy the type of insect which is most suitable for its pollination.

This little orchid, *Caladenia latifolia* R.Br., is the only *Caladenia* I have seen which secretes free nectar.

Although found in many parts of this State and occurring in most of the other States, in the districts of Blackwood and Coromandel Valley it is comparatively rare, only a few isolated communities having been found. This makes it difficult to base observations on a large number of plants.

Several years ago I noticed that the few flowers I had under my observation were successfully pollinated in nearly every case. This induced me to examine the flowers more carefully to find out, if possible, what was the attraction for the insects which so regularly visited these plants, with the result that the flowers were found to possess two distinct nectar glands.

Fig. I gives one an idea of the shape of this pretty little pink flower. It will be noticed that the labellum is distinctly three-lobed. The lateral lobes are entire and clasp the sides of the column, while the central lobe is recurved and is irregularly toothed on the margin. At the point where the middle lobe is abruptly bent we find a number of rather tall calli arranged in a semicircle and forming a barrier which prevents unimpeded entrance to the flower.

If the labellum is removed from a mature, but unfertilized, flower we see the nectar which has been excreted by the glands appearing as two clear drops of fluid, one at each side of the column at its base and on the juncture of the wings of the column with the column proper. When the flowers are kept protected from the drying effects of winds or bright sunshine, the nectar accumulates to such an extent as to fill the cup-shaped hollow at the base of the column. The nectar is distinctly sweet to the taste and when tested was found to contain a reducing sugar. Even in buds which have not opened, the nectar glands are found to be excreting fluid, so that from the moment of opening, the flower offers every inducement to insects to visit it.

In Fig. III., we have a highly magnified view of the left-hand side gland from a bud which was on the point of opening. It will be noticed that the centre of the gland is a hollow about 24 cells in length with an average width of 2 cells and sunk abruptly below the level of the surface of the column to a depth of 2 or 3 cells. This hollow is surrounded by a few rows of turgid cells which secrete nectar as well as those of the central cleft. The cells which constitute the surface of the column are much smaller than the actively glandular cells.

As the flower matures the width of the cleft is reduced by the swelling of the cells composing its side walls, these cells now being

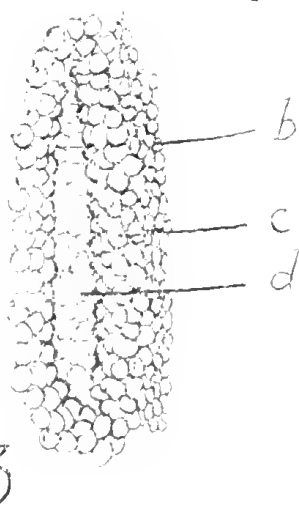
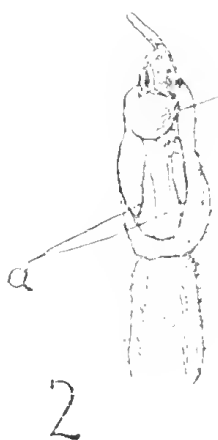
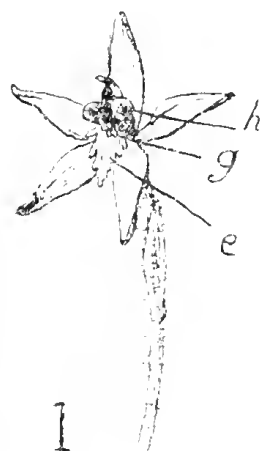
in a state of vigorous activity. Simultaneously with the reduction of its width, the cleft undergoes a considerable increase in length owing to what appears to be separation of the cells along a line leading from the top of the gland upwards. The cells bordering this new portion of the central hollow become turgid and excrete nectar thus greatly increasing the active surface of the gland.

A curious and interesting fact was noticed regarding one of the glands of a flower which was examined. This flower, closed when found, had been fertilized by a pollinium which lay on the right-hand edge of the stigma (Fig. II). The gland underneath the fertilizing pollinium was quite dry, while the left-hand side gland was still freely secreting its nectar. There is no doubt that this is caused by the fact that, although to our eyes the stigma appears a simple organ, in this case it is formed from two functional, though completely confluent, stigmas and another stigma which has lost its true powers and has taken the form of a sticky disc or rostellum. In the genus *Caladenia* this rostellum is very poorly developed and can scarcely be distinguished from the functional stigmatic surface. Evidently the nectar glands are in close association with the functional stigmas for we have seen that the excretion of nectar from a gland is greatly modified by the condition of its fellow stigma. No doubt in the past this would have been of service to the flower, for if one gland should prove dry through the pollination of its associated stigma, an insect visitor would then be more likely to visit the other gland and thus have a tendency to put any further pollinia on the other side of the stigma.

In the flower as it is at the present time, any such advantage is useless, for the flower closes so quickly after pollination that few insects would have any chance of aiding in more complete fertilization. In most cases flowers of this species show a distinct reaction within 24 hours of pollination and by the end of 48 hours, closure is nearly finished.

Although I have never seen the act of pollination, the shape of the flower suggests that the method is very similar to that adopted in *Caladenia deformis*. To enter the flower the insect visitor would have to overcome the barrier imposed by the calli which stand in its path. This could be achieved by vigorous exertions with its legs as it enters while using the column at its back to gain sufficient purchase. During this struggle or while drinking its fill from the nectar glands, the back of the insect would be coated with secretion from the stigmatic surface and on leaving, the pollinia would be drawn out of their cells to be carried away on the back of the insect to another flower. There

they would be left on the prominent stigma while the insect enjoys the reward offered for its services. Thus is the flower served and the insect satisfied.



H.G.

Fig. 1.—*Cadadenia latifolia*, natural size.

Fig. 2.—Column (x 4).

Fig. 3.—Nectar gland highly magnified.

a, Position of nectar glands; *b*, normal cells which constitute surface of column; *c*, glandular cells surrounding central hollow; *d*, central hollow; *e*, central lobe of labellum; *f*, semicircular row of calli on labellum; *h*, side lobes of labellum; *i*, portion of pollinium on stigma.

BOTANICAL NOTES.

By ERNEST H. ISING.

Native and Introduced Plants growing along the Roadside at Mount Lofty. Additional List No. 1st.

Scarceola microcarpa (Goodeniaceae). One plant was observed in flower in 1933 from March to November inclusive. It was growing on a steep dry cutting and flowering profusely but the dry spring evidently killed it as it gradually shrivelled up towards the end of November. This cutting was cleared of all vegetation at the end of 1933.

Olearia grandiflora (Compositae). A plant has been growing in one situation for a number of years and it made excellent growth during the spring of 1933 and produced about 60 flower heads in November and December. This plant had previously been cut down at ground level and afterwards made this vigorous growth.

Notes on *Baeckea ramosissima* A. Cunn (Myrtaceae).

In Black's Flora of South Australia (p. 403) the only part of the Mount Lofty Ranges where the species is recorded is near Myponga and Square Waterhole. I have collected it at Aldgate (on 29.28 and since) growing in swampy ground where it is abundant.

Notes on *Viola hederacea* Labill. (Violaceae).

According to Black's Flora of South Australia, this species is to be found in the South East; Hindmarsh Valley and Kangaroo Island. I can now record it from Mount Lofty growing in patches in the stringy-bark (*Eucalyptus obliqua*) forest in flower during November.

C. For original list see this Journal Vol. XIII (1932), 29.

Owing to lack of space, the Brief History of the Field Naturalists' Section, by W. H. Selway, is held over till next issue.

VOL. XV., No. 3.

June 12th, 1934.



THE South Australian Naturalist

THE JOURNAL OF THE FIELD NATURALISTS'
SECTION OF THE ROYAL SOCIETY OF SOUTH
AUSTRALIA AND OF THE SOUTH AUSTRALIAN
AQUARIUM SOCIETY.

Hon. Editors: Wm. Ham, F.R.E.S.
and BERNARD C. COTTON.

The Author of each article is responsible for the facts and opinions recorded.

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Published Quarterly.

Price: NINEPENCE.

Obtainable from Rigby's Book Shop, Grenfell Street, Adelaide.

Registered at the G.P.O., Adelaide, for transmission by Post as a Periodical.

FELSTEAD & OMSBY, PRINTERS, Delmont's Buildings, Anster Street, Adelaide.

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Bookings for the Special Excursions (marked with a star on the Programme) should be made with Mr. B. Cotton, the Museum, North Terrace, or with Mr. R. C. Shinkfield, Weather Bureau, West Terrace, Adelaide. In the case of Motor Trips, ticket is to be paid for at time of booking.

EXCURSIONS.

June 4—Hallett's Cove. Glacial Features. Leader, Dr. C. Fenner.
June 23—Museum. General. Leader, Mr. H. M. Hale.
July 7—Prospect. Timbers. Leader, Mr. A. J. Wiley.
July 28—Henley to Grange. Conchology. Leader, Mr. F. K. Godfrey.
August 11—Gandy's Gully. Foothills Flora. Leader, Dr. Christie.
August 25—Roseworthy. Botany and Birds. Leader, Mr. E. H. Ising.

LECTURES AND EVENING MEETINGS.

June 25—Agriculture. Dr. A. E. V. Richardson.
July 17—Rambles by Australian Rivers. Dr. C. Fenner.
August 21—Annual Meeting. Exhibits.

The South Australian Naturalist.

Vol. XV. ADELAIDE, JUNE 12th, 1934. No. 3.

BRIEF HISTORY of the FIELD NATURALISTS' SECTION of the ROYAL SOCIETY OF SOUTH AUSTRALIA

Written for the Jubilee Celebration on 21st November, 1933.
By W. H. SELWAY (*Foundation Member*).
[ABRIDGED]

On two former occasions, in 1904, when the Section completed its 21st year, and in November, 1908, when it celebrated its 25th anniversary, I have given a brief review of its history. Fifty years ago, on the 13th of this month (November), the first meeting was held. You know we are essentially a Natural History Society, but do you all know that a Society with such a name was started before the settlement of this State—or Province—it was then called—was two years old?

From John Blacket's "History of South Australia," it is learnt that in December, 1838, the pioneers formed the "Natural History Society of South Australia," its object being "the cultivation of the Science of Natural History in all its branches, more especially the natural history of South Australia. His Excellency Governor Gawler was chosen Hon. President, Mr. A. H. Davis, President, Mr. Osmond Gilles, Treasurer (he was also Treasurer of South Australia), and Secretary, J. E. Bright. Other well-known names were on the Council, including John Morphett, George Stevenson, David McLaren, Dr. Wyatt and Judge Jickling. It is stated that Osmond Gilles offered a piece of land (29.12 '38) near Hurtle Square on which the Society was at liberty to erect a building. Another account says that this land was *presented* and the question has been raised as to what became of this land. Our pioneer Entomologist, says Mr. Blacket's account, "was Mr. C. A. Wilson, M.E.S., who, week after week, contributed to the "South Australian Register" valuable notes on Natural History. He wrote under the name of "Naturae Amator."

And now let me take up the story of the origin of the Field Naturalists' Section of the Royal Society of S.A. The first date having reference to a proposed "Natural History" section of the Royal Society was August 14th, 1883, when a special

meeting of the Council of the Royal Society was held. At an ordinary meeting held on the 4th September, 1883, the Vice-President of the Royal Society, the late Dr. H. T. Whittell, read a draft of the Rules for the regulation of the proposed "Natural History" Section. Notice of motion was given that these rules would be brought forward at the next meeting for consideration and adoption. Accordingly, at the annual meeting held on 2nd October, 1883, Professor Ralph Tate, F.G.S., F.L.S., explained that "a number of young men connected with certain Societies in the city had intimated a desire to prosecute the study of Natural History under the countenance of the Royal Society, and as the Council approved of the idea, they had drawn up regulations. These regulations, seven in number, are then set out, the first one reading thus: "This Section is established to promote the practical study of Natural History by affording fuller opportunities and facilities for meeting and working together."

Regulation 5 is of considerable importance for it states that subscribers to the Section shall have access to the Library of the Society (that is, the Royal Society) and shall be entitled to a copy of the "Miscellaneous Contributions to Natural History, and the Annual Reports published by the Society for the current year." How many of you know what privileges you have, and all for 7 6 a year (originally 5 -), the extra 2 6 being added when we established our own Journal, "The South Australian Naturalist."

The President of the Royal Society, then Mr. Charles Todd, C.M.G., afterwards Sir Charles Todd, K.C.M.G., (P.M. General) spoke in favour of the proposal. The proposed regulations were confirmed at that meeting (2nd October, 1883). At the same meeting, Mr. W. E. Pickels, F.R.M.S., who had been elected a Fellow of the Royal Society the previous month (4/9/1883), suggested that in inaugurating this Section, a *Conversazione* should be held at the Town Hall and that Professor Tate might elucidate to probable members the objects of the Section.

In the "Annual Report" submitted to the Council at the same meeting (2nd October, 1883), reference is made to the proposed formation of the Section in these words:

"Another new departure contemplated is the formation of a Section for the more especial study of Natural History in the field. To make the proposed Section as popularly and publicly useful as possible, it is intended to allow persons not wishing to become members of the Royal Society, to join the Section only, and by a moderate subscription obtain certain collateral advantages."

The Annual Meeting (2/10/'83) having approved of the Council's proposals as to the suggested Natural History Section, the way was now clear to getting such a Society started. Accordingly the next step was to call a meeting to explain its objects. I may say I do not see the term "Field Naturalists' Section" used until this meeting was called by advertisement in the daily newspapers of 5th November, 1883, the references previously being to "Natural History" Section". An advertisement in the "Register" of 5th November, 1883, after announcing the ordinary meeting of the Royal Society for Tuesday, 6th November, states: "On the following evening (i.e., November 7th) at 8 o'clock in the Banqueting Room of the Town Hall, Adelaide, Professor R. Tate, F.G.S., will deliver a lecture on the objects of the Field Naturalists' Society. Ladies and gentlemen desirous of becoming Foundation Members are invited to kindly attend and register their names. Admission free to lecture. (Sgd.)—A. Molineux, Asst. Hon. Sec.

On the following day, November 6th, 1883, a paragraph appears in the "Register" in which it is explained that to save disappointment, only those can be admitted to the lecture to whom tickets have been forwarded or those who are Fellows, members or associates of the Royal Society.

The lecture by Professor Tate in the Banqueting Room of the Town Hall on 7th November, 1883, to explain the objects of the Section, was, as stated in the "Register" next day, "highly interesting, and was greatly enjoyed by those who had the good fortune to be present." I was one of those fortunate ones and can confirm the opinion thus expressed. I remember that the Professor's first words were "Have you a hobby?" He went on to explain the many benefits to be derived from a study of nature, and that it was a cheap, interesting, and easy hobby to acquire. If time permitted, I should like to read the whole of the excellent newspaper report of the lecture. As a matter of history, however, I should just mention that the Professor told us that the first Field Club to be established in the United Kingdom was that in Berwickshire in 1831. He himself had founded one in Belfast in 1863. Amongst others who had been connected with such clubs in the old country were Rev. W. Howchin and Mr. W. E. Pickels, so that they had plenty of organising power to start one here in Adelaide. I notice that a statement of the lecturer that Ladies were especially welcome to become members of the Section was greeted with "loud applause."

I had the honor of proposing a vote of thanks to Professor Tate for giving this lecture.

I should have mentioned that Dr. H. T. Whittell, then President of the Royal Society, occupied the Chair and remarked that the lecture was "intended mainly for the members of the Young Men's Societies in and around Adelaide, and they had been specially invited to be present." I may mention that four out of the eight members of the first Committee of the Section belonged to such societies. I have recently learned that it was one of these Societies which probably set in motion the first practical steps towards the formation of the Section. Messrs. Harry Dean and W. E. Pickels, both members of the Adelaide Literary Society, were delegated to wait on Professor Tate and ask him to form a Natural History Section of the Royal Society, which he consented to do.

Events then moved rapidly. Six days after Professor Tate's lecture, namely on Tuesday, November 13th, 1883, the first General Meeting of the Section was held in the S.A. Institute (upstairs, if I remember rightly). Professor Tate was elected to take the Chair and after rules for the management of the Section were adopted, nominations for the various offices were made, resulting as follows:—

Chairman, Professor R. Tate, F.G.S., F.L.S.; Vice-Chairmen, Mr. H. T. Whittell, M.D., Rev. W. Howchin, F.G.S.; Committee (names in order as they appear in minute book)—Messrs. W. L. Cleland, M.D., W. Haacke, Ph.D., J. G. O. Tepper, F.L.S., A. Molineux, F.R.S.S.A., W. H. Selway Jun., George Collis Jun., H. Dean and G. F. Hussey; Hon. Secretary, Mr. W. E. Pickels, F.R.M.S.

The Committee then proceeded at once to make Rules for the conduct of Field Excursions.

I think it may be safely said that the moving spirit in getting this Section started was Mr. W. E. Pickels. He was a very energetic man and enthusiastic as to the benefits of Field Clubs. He almost compelled people to join whether they wished to or not. Unfortunately, in the early part of 1885, after about 15 months' service as Hon. Secretary, business called him to Melbourne, and his resignation was received in May of that year. A testimonial in the form of a handsome gold chain and locket, the latter suitably inscribed, was subscribed for by the members of the Section in recognition of his services.

As scientific head of the Section, and its first Chairman, Professor Tate was a tower of strength to the newly formed Society. His scientific attainments, both in the realms of Geology and Botany, were freely placed at the disposal of the members. At the end of his second year of office, he remarked that, although he ceased to be Chairman, he would ever be ready to show

an active interest in the Society. At the Annual Meeting on October 21st, 1884, Professor Tate was presented with an illuminated address "for the services he had rendered in so successfully promoting the establishment of the Section." (He died on 20th September, 1901, at the age of 61 years).

Amongst others who greatly helped the Section in its very early years were Rev. (later Professor) W. Howchin, F.G.S. (Geology), Mr. J. G. O. Tepper, F.L.S. (Botany, Entomology, and nearly every other branch of Natural History, for his attainments were very varied and his knowledge willingly imparted to others); Messrs. W. T. Bednall and D. J. Adcock (Shells), and Mr. A. Molineux (Trawling and Dredging).

I cannot, of course, in the limited time at my disposal, refer to all who have occupied the office of Chairman, but I should like just to mention the second, viz: Dr. W. L. Cleland, who was Secretary of the Royal Society for many of the years in which I was secretary of the F.N. Section. We were therefore brought a good deal into contact with each other, and I should like to express my personal indebtedness to him for the help he so kindly rendered. He was, as many of you know, the father of our esteemed member, Professor Cleland, who has the interests of the Section so much at heart.

I suppose, for the sake of historical record, I ought to say that after Mr. Pickel's short term of office as Secretary (about 15 or 16 months) the writer succeeded him in that capacity and remained so for 20 years, the only method, apparently, by which he could obtain release being by taking a voyage to England and the Continent in 1905. The only other member, I believe, who reached double figures as Secretary, is Mr. E. H. Ising, his tenure being a little over 11 years. I was hoping he would go on to break my own record, so capable and esteemed an officer has he been. However, another record has been broken recently, viz: that for the first time in the history of the Section we now have a woman as Secretary, Miss J. M. Murray having been elected to that position in 1933.

The first afternoon excursion of the Section was made on 24/11/1883, to what was then known as "Government Farm," but later as National Park, when about 60 persons attended. The first whole-day excursion (and a memorable one it was,) took place on 1st January, 1884, when between 90 and 100 members and friends journeyed to Hallett's Cove. It was on this occasion that most of those present made their first acquaintance with that interesting geological feature known as glacial action on rock surfaces.

Evening meetings were at first held at the University, then in a room over what was then known as the Art Gallery, North Terrace, later at the South Australian Institute and Public Library, and for several years past in the Royal Society's rooms at the Institute building. It was appropriate that Professor Tate should give the lecture at the first evening meeting on April 22nd, 1884, his subject being "The Australian Lamprey."

Earlier in the same month (April 8th, 1884), Professor Tate moved at an ordinary meeting of the Royal Society that the "Gossip" meetings of the Royal Society and the evening meetings of the Field Naturalists' Section be held conjointly at least once a month. Mr. T. D. Smeaton (father of our one-time member) seconded the motion which was carried.

FAUNA AND FLORA COMMITTEE. NATIONAL PARK.

Dealing now with the activities of the Section, I must first mention the labours of the "Fauna and Flora Protection Committee," which was elected on 21st August, 1888, only five years after the establishment of the Section. On that date the late Mr. A. F. Robin read a paper on "The Better Protection of our Native Fauna and Flora," and a motion was carried having that end in view. In pursuance of that resolution, Professor Tate, Messrs. A. Zietz, S. Dixon, J. G. O. Tepper and A. F. Robin were appointed a sub-committee to carry out its objects. It was resolved on the motion of Mr. S. Dixon "that in furtherance of the proposed objects this Section desires to recommend that Government Farm be declared a public park and handed over to trustees to manage, and hoped that the Royal and other Societies interested will assist in obtaining this desideratum." The Chairman and Hon. Secretary of the Section, for the time being, were afterwards elected ex officio members of the Committee. Such was the beginning of the long and persistent efforts to obtain Parliamentary sanction to this Committee's aims, for it was not until 19th December, 1891 (three years later) that an Act vesting the Park in trustees, was passed.

Mr. S. Dixon, Chairman of the F. & F. Committee, in a farewell address on 19th September, 1911, after occupying the Chair for 23 consecutive years, gave the salient facts in connection with the efforts to secure the National Park at Belair. In my addresses in the years 1909 and 1910, as Chairman of the Section, on the National Parks and Forest Reserves of Australia, I gave a resume of these efforts. Those addresses are published in pamphlet form and can be seen in our library, but the fullest

account is given in a letter to the "Register," published on October 7th, 1901. It was written by Mr. M. Symonds Clark, the successor to Mr. Robin as Secretary of the F. & F. Committee, who resigned in 1895 owing to ill health. The chief object of the letter was to show that it was Mr. Robin's persistent and untiring exertions which led to the Act of 1891 being passed, which Act vested the Park in Trustees. We must not forget, however, that the plan of vesting it in Trustees was conceived by Mr. Dixon and he himself claimed that the successful fruition of his motion of 21/8/'88 entitled him to be regarded as the "Founder" of the Park (vide report of F.N.S. for 1912/13).

It may be added that Mr. Clark, in his letter referred to above, gave due credit to Messrs. James Page and Walter Gooch for their valuable efforts at earlier stages in the history of Government Farm to save it for the community. Mr. Clark pointed out however, that notwithstanding those efforts and the passing of Act No. 285 of 1883, the land was subsequently cut up into blocks for sale, and would certainly have been disposed of had not other influence been brought to bear on the Government of the period to prevent this. The Act of 1891, by vesting the Park in *Trustees*, placed it beyond the control of Parliament, and thus obtained security of tenure for future generations. This Act was the outcome almost entirely of the labors of the Section's F. & F. Committee.

FLINDERS CHASE.

This somewhat resembles the story of the struggle for the National Park at Belair, only being much more prolonged. It began, according to Mr. Dixon, as far back as 1893, two years after we had secured the Belair Park. In that year, at the Hobart Meeting of the Australasian Association for the Advancement of Science, which Professor Tate, Mr. Robin and Mr. Dixon attended, a motion introduced by the last named asking our Government to dedicate the Cape Borda Lighthouse reserve for our objects, was carried. Correspondence and deputations followed. On 15th August, 1906, the Secretary, Mr. M. Symonds Clark, wrote to the Premier suggesting that eight gentlemen should be appointed as Trustees. The Cape Borda reserve of 67 square miles was granted, but this was regarded as absurdly inadequate, the total area wanted being 300 square miles. From 1907 onwards, Mr. F. Ashby rendered valuable assistance by interviews and correspondence with the Premier. On 10th February, 1910, the reserve at the west end of Kangaroo Island was gazetted as a Fauna and Flora Reserve, the area being approximately 146 square miles.

Mr. Ashby succeeded Mr. Dixon in 1911 as Chairman of F. & F., and Mr. M. S. Clark, after about 19 years as Secretary of the F. & F. Committee, retired in the year 1913/14.

On May 1st, 1918, Mr. Ashby resigned his Chairmanship prior to leaving for America, and Capt. S. A. White was elected as Chairman. In the same year the Royal Society took a hand and elected a committee comprising Messrs. S. Dixon, J. M. Black and Captain White to arrange a deputation to the Attorney-General, Mr. H. N. Barwell. A circular was issued, setting out the objects of the Chase and circulated among members of both Houses of Parliament and others. It was not until 1919 (26 years after the agitation began) that the long-awaited results of our labours for Flinders Chase were rewarded by the passing of the desired Act which was assented to on October 16th, 1919. Its short title is "Fauna and Flora Reserve Act, 1919;" a Board was constituted called the "Fauna and Flora Board of South Australia," and all the Crown Lands in the schedule (coloured red in a map of Kangaroo Island) were vested in this Board for the "purchase of a Reserve for the protection, preservation and propagation of Fauna and Flora, and as a pleasure resort, and for the other purposes of this Act. The said lands shall be called 'Flinders Chase'." The Surveyor-General recently informed me that the total area of the Reserve is 198 square miles. You remember we wanted 300 square miles.

Apart from the great achievement of securing (or helping to secure) these National Reserves, the F. & F. Committee have all along kept a watchful eye on Game Acts, assisting in their introduction, and calling attention to their infringements. Such animals as kangaroos, opossums, wallabies, seals, birds, etc., as well as plant life have come under their purview. I am glad to say that the present Chairman of the F. & F. Committee (Lt.-Col. D. Fulton) is very keen on its objects and is taking special interest in the due observance of the wild-duck season.

WILD FLOWER SHOWS.

Of recent years these have been an important feature in our activities. The first "comprehensive show of this kind," to quote the words of the Annual Report, was held in October, 1920, and was very successful. It was not the first "show of native plants," for that was held in the Banqueting Room of the Town Hall on October 25th, 1888—45 years ago—when we were only 5 years old. The native plants then were represented mostly by pressed specimens, for we were anxious not to be charged with the

destruction of our native flora as happened in New South Wales, when Wild Flower Shows (at Manly, I think) were suppressed on this account. In the 1888 Show, however, there were cultivated cut flowers (native) including Waratahs, and there were prizes for button-hole bouquets and pot plants. The Wild Flower Shows of recent years have proved not only pleasing for their beauty, but instructive as well, and have also been a useful source of revenue.

LOCAL CORRESPONDENTS or CORRESPONDING MEMBERS.

One method by which it was hoped that the usefulness of the Section might be widely extended was by the election of corresponding members, who were scattered throughout the State. This movement occurred at the end of 1888 and the early part of 1889 and was another suggestion of Mr. Robin.

These members were supplied with a lot of printed information as to pressing plants, forwarding specimens, etc. These instructions, by the way, were formerly in the possession of the Adelaide Philosophical Society, which was afterwards merged into the Royal Society of S.A. Some of these correspondents took much interest in this scheme and forwarded us useful nature notes and many specimens, the latter being handed over to the Museum. This interest, however, was not very general, nor long sustained.

SHELLS.

From the very early days of the Section, the study of Shells occupied a prominent place. I find that in 1886, Mr. W. T. Bednall gave a paper on "The Collection and Classification of Shells." Mr. D. J. Adcock was another who was recognised as an authority on the subject. Later on, a separate Section, "The Malacological Section of the Royal Society," was formed and continued for many years, the leading spirit being the late Sir Joseph Verco. I noticed recently in our rooms a parcel of books labelled "Malacological Section of the Royal Society 1894 to 1917," that is 23 years. Messrs. F. Trigg and F. K. Godfrey have kindly supplied a few notes with regard to the formation and work of the present Society, which are printed below under the heading of—

SHELL COLLECTORS' CLUB.

The first meeting was held in the Royal Society's Rooms, North Terrace, on June 22nd, 1925. 20 members were enrolled. Mr. W. J. Kimber was elected Chairman, a position he held until December, 1931. Mr. F. Trigg became the first Secretary.

Objects—The study and collection of South Australian shells.

Sir J. C. Verco's cabinet list of shells, based on Hedley's 1917 list of N.S.W. Mollusca and May's 1921 adaptation for Tasmanian Shells, was progressively supplied to members as the Club's basis for classification.

Mr. Kimber, in 1925, started a review of the more common shells, and in 1927 began a more detailed survey which was continued until his retirement as Chairman in December, 1931.

The name of the Club was changed to "The Malacological Society" in December, 1931. Chairman, Mr. F. K. Godfrey; Secretary, Mr. W. Broadbent. The Malacological Society gave its support to Messrs. Cotton and Godfrey's work of revising the list of South Australian Mollusca, and published in the S.A. Naturalist regularly since August, 1931; the publication costs were mainly defrayed by the generosity of the late Sir J. C. Verco and Dr. Torr. The work is about half finished and it is hoped that finance can be arranged to permit of its completion and publication. The present officers of the Malacological Society are:—Chairman, Mr. F. Trigg; Vice-Chairmen, Messrs. B. C. Cotton and J. Plunket; Secretary and Treasurer, Mr. W. Broadbent. The "Shell Club" and its successor, the "Malacological Society" have regularly taken an active interest in the October Wild Flower Show and exhibited shells.

Members of the Field Naturalists' Section are welcomed at the meetings and in the beach work.

MICROSCOPE COMMITTEE.

From the very inception of the Section the microscope has been regarded as a most useful adjunct to its activities. In Prof. Tate's inaugural lecture, to which I have referred, he stated that "at the evening meetings the microscope would be a chief feature." Concurrent with its formation, a Postal Microscopical Club for exchange of slides, was formed. In 1884, Dr. Cleland and Mr. R. L. Mestayer, C.E., delivered papers dealing with the microscope. Later was established the Microscopical Section of the Royal Society—our first full brother, or, if you prefer it, sister. Messrs. W. B. Poole and E. J. Bradley were among the most enthusiastic supporters of it. But it languished after some years of useful work and appreciated assistance (especially at our Conversaciones) and finally went out of existence.

However, in the financial year 1927-8, its objects were revived by the establishment of the Microscopic, or as it sometimes called, Microscope Committee of this Section, when Mr. A. W. Harding was elected its Chairman and Mr. Collins its Secretary. This adjunct of our Section always makes a good display at our Annual Wild Flower Show.

ORNITHOLOGY.

The Study of Bird Life has had many followers during the Section's existence, the first I remember being Dr. W. T. Angove. The late Mr. M. Symonds Clark read a paper on "Our Native Parrots," which occupied 18 pages of our "Proceedings" for the year 1888-9, and should be useful for reference. Captain S. A. White has always been to the fore in advocating the usefulness of our native birds from an economic standpoint, whilst the enthusiasm of Mr. Edwin Ashby in this department is well known. Others who should be mentioned are the late Mr. J. W. Mellor, the late Mr. A. Zietz and his son, Mr. R. Zietz, and more recently, Mr. E. A. Thomas.

The formation of the Ornithological Association of S.A. naturally attracted several of our bird lovers and to some extent weakened the Section's activity in this particular branch of work.

HERBARIUM COMMITTEE.

In 1923 a Committee was formed with regard to obtaining records of the Geographical distribution of the Native Plants from all parts of the State. To do this it was said to be necessary to depend almost entirely on our friends in the country to collect specimens and forward them. The idea is to record all the plants in the State by collecting them and storing them in an herbarium with particulars as to locality, date, collector's name, etc. The herbarium will be available to those interested.

In the following year's report (1923-4), it was mentioned that an attempt was being made to make a plant survey of our local parks and reserves, both of indigenous and naturalised flora. In 1929 it was mentioned that this report was prepared and ready for publishing when funds permitted.

This herbarium work is being carried on by a Committee under the able leadership of Prof. J. B. Cleland.

"S.A. NATURALIST"

One of the most progressive movements made by the Section was the decision to start a journal of its own. The proposed new enterprise was keenly debated and the question of ways and means carefully considered. Eventually, it was thought that by increasing the subscription from 5 to 7 6 per annum, it could be done. The cost of printing advanced beyond our expectations but we have kept the journal going. It is here that the profits made by our Wild Flower Shows have come in handy. We were

fortunate in having as our first editor a gentleman who had previous experience of this kind in another State. I refer to Charles Fenner, D.Sc. He gave the "Naturalist" a very good start in November, 1919, and when official duties prevented him continuing, we were again fortunate in securing as editor in November, 1921, Mr. W. Ham, who has continued for the 12 years to the present time to perform his onerous duties with marked ability. In addition to necessary and interesting matter relating to our own Section, we are kept in touch, by means of exchanges with kindred societies in other parts of the world. I may add that the well-illustrated descriptions of Australian Shells by Messrs. B. C. Cotton and F. K. Godfrey are of especial value to the students of that branch of work.

CONCLUSION.

In conclusion, ladies and gentlemen, may I say that I have endeavoured to trace the history of the Section from the time before it actually came into existence until the present, and dealt with its objects and activities. I think you will admit from the record I have given that the Section has fully justified its existence. It has inculcated and developed a love of nature in very many people; it has done useful work for the State as a whole; it was the chief agency in securing the National Park at Belair vested in Trustees as a means of protecting our native fauna and flora and providing pleasure and recreation for the thousands who journey thither; it also laboured hard in the face of great difficulties to obtain Flinders Chase, also vested in trustees, and thus prevent some of our unique fauna and flora from extinction. At its evening meetings practically every branch of Natural History has been explored, while its excursions have covered hill and dale, sea and seashore, within a large radius of Adelaide, and in doing all this, it has, I feel sure, added pleasure, health, and instruction to its members and friends. In the words of Professor Tate at his inaugural lecture, I would ask those who are not already members—"Have you a hobby?" If not, what about joining up with the Field Naturalists?

Dr. D. G. Torr, of Brighton, has kindly sent along one guinea as a gift towards the publication of the part on South Australian Shells

SOUTH AUSTRALIAN SHELLS.

(Including descriptions of New Genera and Species).
(By BERNARD C. COTTON & F. K. GODFREY).

PART XI.

TROCHIDAE.

Conical, pyramidal, subglobose, turbate, or helicoid; aperture entire, tetragonal or rounded, nacreous within; peristome generally not continuous. Operculum circular, thin, entirely corneous, formed of numerous gradually increasing whorls, nucleus central.

Distribution—World-wide. Very many species live in the littoral, and laminarian zones, and many are deep sea forms. Fossil—Ordovician.

Animal with head probosciform; tentacles tapering, sometimes ciliated; eyes on free peduncles at their outer bases; two more or less developed head-lobes between the tentacles; gill single, long and linear; sides of foot with a large neck-lappet near the eye-peduncle, continuous with a conspicuous side-membrane, bearing on its free margin from three to five tapering filaments; operculigerous lobe often with cirri. Sexes are separate. Herbivorous.

Shells differ from those of the *Turbinidae* chiefly in having a corneous, never calcareous, operculum, which is always multi-spiral.

Trochus (a trundling hoop for children) was first used by Rondelet 1558, in the sense of a top, which is an error, and comprised a rather miscellaneous assortment of univalves. Linnaeus restricted the genus, but still retaining species of several very different families. Lamarek further restricted the group. During the past 60 years, Gray, the Adams brothers, Finlay, Iredale and others have contributed much towards a systematic arrangement of the family. True *Trochus* is not represented in South Australia. The large, well known conical *Trochus* (*T. niloticus*) found on the Barrier Reef, is used for the manufacture of pearl buttons, and 960 tons were exported from Queensland in 1916, the value being £23,000. From ten tons of shell, one ton of meat is taken by the more careful Japanese fishermen, and this after being smoked and dried is worth £20.

Clanculus Montfort 1810. Conoidal or turbate, not umbilicate; whorls mostly granulose; periphery rounded or angular; base flat or convex; aperture contracted; columella spirally twisted, forming a false umbilicus, plicate throughout and terminating in a multidentate varix; outer lip usually dentate within,

with sometimes a large superior tooth. Type—*Trochus pharaonius* Linné (Red Sea). Distribution—Indo-Pacific, Mediterranean. Animal with four pairs of tentacular filaments on the epipodial line. Coasts of Southern Australia are rich in *Clanculus* species, some of which are common.

The varied species of *Clanculus* occurring in S.A. may be arranged in six subgenera:—

Macroclanculus subgen. nov. Large, fairly solid, finely sculptured, umbilicus wide and shallow; columella entering it and strongly wrinkled with but a comparatively narrow tooth at the base; umbilical margin almost smooth; outer lip wrinkled within to the edge. Type—*Clanculus undatus* Lamarck. *C. undatus* may be subgenerically separated from *C. pharaonius* on the columellar and umbilical features mentioned above.

Euriclanculus subgen. nov. Small, depressed, squat, thick, rather coarsely sculptured shells; umbilicus wide and deep; columella entering it and coarsely wrinkled, a prominent tooth below; outer lip irregularly wrinkled within but not margined as in *C. pharaonius*. Type—*C. flagellatus* Philippi. The following may be located here:—*C. limbatus*, *personatus*, *maxillatus*, *anus*.

Microclanculus subgen. nov. Type—*C. euehelioides* Tate. That shell naturally separates itself from typical *Clanculus* (restricted), by the simplicity of the apertural and umbilical characters combined with those afforded by the sculpture, and warrants distinction subgenerically.

Isoclanculus subgen. nov. Very narrowly umbilicate; spirals with granular zones, obliquely striated between the zones, and a prominent granular spiral near the suture renders the spire stair-like. Type—*C. yatesi* Crosse. *C. ringens* Menke, *C. dunkeri* Koch, and the variants of *yatesi*—*raphaëli* Tenison-Woods, *menkei* Adams & Angas, *philomenae* Tenison-Woods, *purpuratus* Pilsbry, *aloyssi* Tenison-Woods, *philippi* Koch, *conspersus* A. Adams, are also included.

Mesoclanculus Iredale 1924 (subgenus). Type—*C. plebejus* Philippi. The false umbilicus, with the columella joining on the outside, differentiates *C. plebejus* from typical *Clanculus*. We also include *C. consobrinus* Tate, *C. multicarinatus* Tenison-Woods and *C. ochroleucus* Philippi. *C. denticulatus* Gray may be included here though it has a rather distinctive tooth on the inner edge of the umbilical margin above, near the columella.

Euclanculus subgen. nov. Medium sized, top-shaped, thin, finely sculptured; columella distinctive, entering the deep umbilicus, sharply folded back longitudinally, smooth, with a median prominence and basal tooth. Type—*C. leucomphalus* Verco.

C. undatus Lamarck 1816 (*Monodonta*). Pl. 1, fig. 2. (= *Trochus smithii* Wood). Large, depressed conoid, excavated, false umbilicate; cinereous or rose coloured, radiately striped with brown or black, the stripes sometimes broken into irregular maculations, especially on base; protoconch acute, eroded; following whorls finely granose in spiral series, about ten or twelve spirals on each whorl; last whorl with about thirty spiral granose ridges, very close and fine upon and below the periphery, coarser above and around the umbilicus, the interstices obliquely striate; whorls about six, convex around the upper part, then flattened, obtusely angulate at the periphery, sharply carinated in the juvenile, the base flattened, concave towards the centre: sutures subcanaliculate; last whorl somewhat deflected anteriorly; aperture oblique, tetragonal, outer and basal lips thickened and plicate within; columella oblique, inserted nearly in the bottom of the broad umbilical excavation, its edge reflexed and bearing about ten denticles, twisted near the insertion, terminating below in a simple tooth; parietal tract wrinkled; umbilicus with a plicate border, and in the middle a strong, sometimes crenulate, spiral funicle. Height 16, diam. 28 mm. Not common, Port Willunga, Corny Point, Levens, and fine specimens alive at Middleton. Dredged dead, Beachport 40-150 fathoms. Also Western Australia—King George Sound to Rottnest. (Type locality—we designate Middleton, Encounter Bay, South Australia). The largest *Clavculus*, handsome, solid, purple, red, with small black spots on the granulations; the enamel of the mouth is often much spread over the base as a transparent film. In fully adult shells three sharp denticulations are found on the middle third of the edge of the outer lip, terminating three alternate lines of spiral granulations. The inner surface of the outer lip, and of the expanded basal callus is smeared with rusty brown. The diameter at the base may reach 34 mm., and in some adults is only 27 mm. In immature shells of 27 mm. diam., the columella, and the margin of the umbilicus, and the spiral ridge within it are smooth, the ledge between the latter two is brown and between the first and last white. The following shows height and width in mm. at different beaches, and their percentage of height to width, and the gradual increase in height from Tasmania and Victoria through South Australia, and through Esperance and Albany to Ellensbrook and Rottnest, where also the shells are heavier.

Rottneſt alt.	14.5 x 21.5 mm.	= 67.44% alt.
Ellensbrook	20 x 30	= 66.6 %
..	20 x 28.5	= 70.0 %
Esperance	20 x 35	= 57.0 %
Albany	22 x 34	= 64.7 %
South Australia	17 x 27	= 63.0 %
Victoria	17 x 32	= 53.0 %
Tasmania	17.5 x 33	= 53.0 %
..	17.5 x 32.5	= 53.8 %
South Australia	16 x 29	= 55.0 %
Victoria	17 x 31	= 55.0 %

From the difference shown the Western Australian shell may be named *C. undatus occidentus* subsp. nov. the type locality being Esperance, Western Australia. Dimensions of the type—height 20, diam. 35 mm. (Reg. No. D 10966 S.A. Mus.)

C. flagellatus Philippi 1848 (*Trochus*). Pl. 1. fig. 5 (not *C. floridus* Philippi 1849, from New South Wales). Conoid, umbilicate, granulate; white, with branching stripes of reddish purple; whorls convex, the last rounded; base convex; white; penultimate whorl with six series of granules, the interstices wide as the ridges, obliquely striate; last whorl with eight series of granules above, nine on the base; columella oblique, solute above, the edges rugose-denticulate, terminating below in a prominent tooth; outer lip rugose and dentate within. Height 10, diam. 15 mm. Common, on beach, at Guichen Bay, Rivoli Bay, and MacDonnell Bay; more or less on all ocean beaches from Glenelg River to Point Sinclair. Also Western Australia—Esperance Beach, and Albany; it does not appear to pass round the Leeuwin, as it has not been reported from the western shore of Western Australia. (Type locality—unknown. We designate Robe, Guichen Bay, South Australia). Whorls rather convex, especially above; last rounded, deflected anteriorly and flattened; white, with numerous dark rose-red radiating, sometimes branching stripes above; base rather convex, with nine close granular lines; granules on border of umbilicus but slightly developed.

South Australian examples vary considerably in the depression of the spire; in some the height is 69% of the greatest basal diameter, in others it is only 41%.

Compared with *C. limbatus* Quoy & Gaimard, it is of a lighter colour, being white ornamented with rusty red, and the flames more marked just above the suture (in *limbatus*, just below); *flagellatus* is more depressed, the whorls more convex, instead of nearly straight and sloping; periphery also is more rounded, consisting of close set gemmules, well marked (the periphery of

limbatus is a well marked spiral lira, not gemmulated). Our shell may have nine lirae above the periphery (the ninth forming the periphery) and eleven below, or nine above and ten below, or eight above and eight, nine or ten below, or seven above and seven, eight or nine below, or six above and eight below.

C. limbatus Quoy & Gaimard 1834 (*Trochus*). (= *Trochus morum* Philippi 1848: = *T. variegatus* A. Adams 1851, not Anton: not *C. brunneus* A. Adams 1853, the Sydney shell). Depressed conoidal, carinate at periphery, umbilicate; whitish or yellowish, maculated with brown, generally with a series of blotches at periphery and beneath suture, the intervening space unicoloured or more or less tessellated; base tessellated or radiately flamed; sculptured above with six to eight spiral closely granulose cinguli, the interstices both above and below closely, sharply, microscopically striate; spire low, conical; protoconch acute, smooth; adult whorls four to five, convex just below the suture, then flattened, and at the periphery carinated; last whorl scarcely descending anteriorly; suture subcanaliculate; base slightly convex; aperture tetragonal, oblique; outer lip four or five lirate within, the upper fold somewhat enlarged, subdentiform; basal margin and marginal rib of umbilicus finely plicate; columella oblique, nearly straight, its edge reflexed and plicate-dentate, terminating below in a small square denticle, inserted above upon the side of the umbilicus; umbilicus rather wide, funnel-shaped. Height 14, diam. 18 mm. Not uncommon on beach all round the coast of Southern Australia to Bunbury, Western Australia. Also dredged, alive to 40 fathoms, and dead to 200 fathoms. (Type locality—Western Port, Victoria).

The coarser granulation serves to separate this form from *C. maxillatus* Menke, and from *C. undatoides* Tenison-Woods, a New South Wales shell. The reflexed crenulated edge of the columella is also characteristic. The basal margin of the aperture expanded in fully adult individuals.

Two juveniles from Kingston show very plainly how with the increase in the size of the shell, the number of spirals increases by intercalation, first between the upper two rows of spirals, not counting the row of large infra-sutural nodules, and later between the lower two, so that the three rows are increased to five. On the base the outermost row is the finest and the nodules gradually increase towards the umbilicus.

Measurements of Western Australian specimens, show those from Albany consistently the largest, height 13.5, diam. major 22.25, minor 20 mm; the biggest from Bunbury being 10 x 14.5 x 13 mm.

C. maxillatus Menke 1843 (*Monodonta*). Orbiculate convex; pale brown, obscurely punctate-articulate, or black; transversely granulate-cingulate; cinguli, above six, granose, beneath seven, smooth; whorls nearly plane, the last subangular; base plane; umbilical cavity with crenate margin; aperture rhomboidal, gaping; outer lip with six teeth, the upper one largest; basal tooth of columella large, obtuse, bifid, three on the columellar margin. Height 6, diam. 9 mm. Uncommon, beach, Normanville, Port Willunga, Pondolowie, Beard's Peninsula, Encounter Bay, Point Sinclair, St. Francis Island. (Type locality—Western Coast Australia).

C. anus Philippi 1848. Shell low conic, solid, subangulate at periphery, with a rather wide umbilical excavation, whitish maculated with brown below the sutures, the remainder of the shell tessellated black and white, pinkish or yellowish toward the apex; whorls 5-6, somewhat convex, spirally granose lirate, the lirae 5 or 6 on the penultimate, 12 or 13 on the last whorl of which the sixth is at the periphery; the finely beaded lirae are separated by minutely spirally and obliquely striated interstices as wide as the ridges; the body whorl is a little deflected anteriorly, flattened and excavated in the centre beneath; the aperture is contracted, very oblique, tetragonal; the upper lip is straight with a strong tooth midway between its insertion and the outer angle of the aperture; the outer and basal lips are well curved, thickened and plicate denticulate within; the columella is very oblique, its edge reflexed, and bearing 4 or 5 large tubercles, one at its insertion; terminative below in a strong quadrangular bifid tooth; parietal tract bearing strong white wrinkles; umbilical excavation penetrating but little deeper than the insertion of the columella; its border plicate denticulate. Height 9-11, diam. 12-15 mm. (Australia). *T. limbatus* is more strictly conical with less developed teeth than *anus*, and has a more deeply perforating umbilicus. We designate type locality King George's Sound, Western Australia. Beard's Peninsula, Normanville, Aldinga, Encounter Bay, Point Sinclair, uncommon. At St. Francis Island, Venus Bay, Murat Bay, it is common and more common to the West.

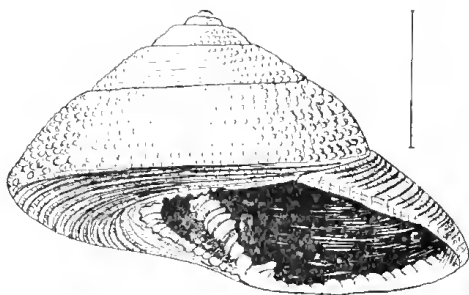
C. personatus Philippi 1847 (*Trochus*). Pl. 1, fig. 8 (= *Monodonta ringens* Philippi 1846, not *M. ringens* Menke 1843). "The Masked Clanculus." Depressed conic; white, dotted with rusty or rusty spots; ornamented with rows of granules (five in the penultimate whorl), last whorl angulated; base markedly and beautifully sculptured with tubercles in five series; umbilicus with crenate margin; columella ending in a valid tooth at base;

PLATE I.

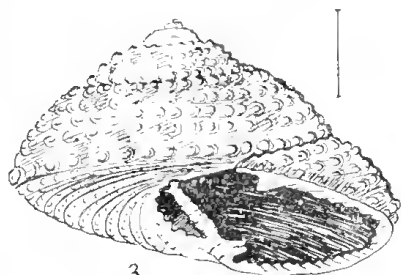
- Fig. 1—*Clanculus euchelioides* Tate.
Fig. 2— „ *undatus* Lamarck.
Fig. 3— „ *flagellatus* Philippi.
Fig. 4— „ *consobrinus* Tate.
Fig. 5— „ *yatesi* Crosse.
Fig. 6— „ *dunkeri* Kock.
Fig. 7— „ *denticulatus* Gray.
Fig. 8— „ *personatus* Philippi.



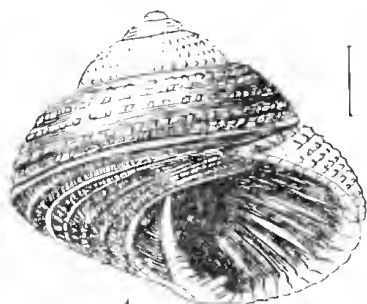
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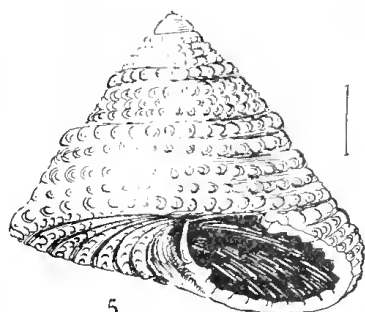
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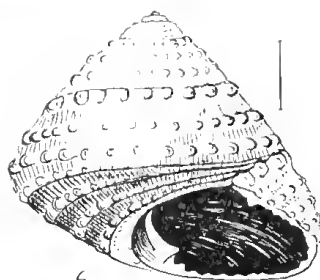
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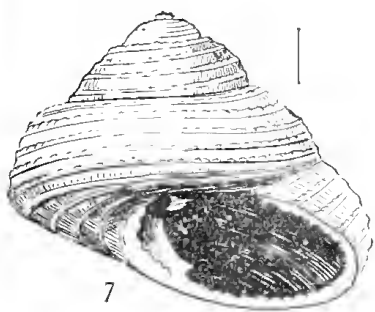
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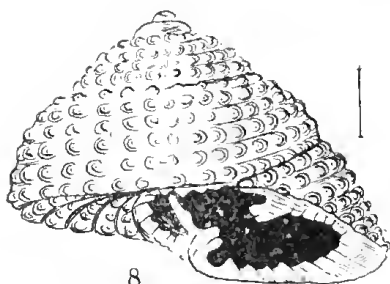
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7



8

aperture constricted by the very noticeable contraction of the body whorl at the outer lip, outer lip dentate within, highest tooth very large. Height 13, diam. 18 mm. Rare, Levens Beach, typical (Cotton): Western Australia—not uncommon, Rottnest Island, Ellensbrook, Albany. (Type locality—New Holland). The species is moderately flatly conic, the five whorls somewhat swollen, the last moderately angular, each whorl with five to six series of tubercles, the lowest tubercle standing upon the angle of last whorl; base moderately flat with five rows of grains; mouth rather strongly contracted for the genus; outer lip thickened within, uppermost tooth wide, blunt, strongly projecting; umbilicus very widely open and at border moderately strongly toothed; colour is rosy red, or reddish brown spots upon a white ground; base pure white.

Allied to *C. maxillatus* Menke, but differs in the deeper umbilicus, the smooth not tubercular edge of the columella, the stronger development of the teeth, more distinct granulation, and the very contracted aperture. The mouth is almost horizontal, the umbilicus and mouth are both narrower than in *C. maxillatus*.

C. euchelioides Tate 1893, Pl. 1, fig. 1. Turbinately conic, somewhat solid; opaque, reddish; cinguli three, on early whorls, the posterior cingulus being the smallest; penultimate whorl with a riblet between anterior suture and first cingulus, between first and second, and second and third cinguli; last whorl with seven cinguli on upper surface and interposed riblets here and there; base with seven cinguli, with an interposed riblet in the one or two exterior sulci; no conspicuous rib margining the umbilical area; whole surface of shell (except the protoconch) is sculptured with fine close oblique striae, which pass over the principal cinguli, which occasionally show a tendency to granulation; whorls about six (including the protoconch), separated by a canaliculate suture and flattened posteriorly, last whorl convex in the anterior third; base flatly convex, falsely umbilicate, the columella entering the umbilical depression, which is shallow and moderately narrow; aperture oblique, rhomboid-oval; outer lip slightly depressed at suture; outer and basal margins thin, lirate, and iridescent within; columella oblique, rib-like, with an attenuated keel elevated into a tooth-like prominence at base, and separated from the basal margin of the aperture by a deep notch. Operculum multispiral. Height 6.25, diam. maj. 6.5, min. 5.75 mm. Living at low tide mark, under stones, Moonta Bay (type locality); also dredged at many stations, South Australia and Western Australia, alive to 30 fathoms, and dead shells only to 200 fathoms. The animal has the foot white below;

purplish neutral tint above. Four purplish cilia on each side. Two stout tentacles with the eye just outside the base.

C. yatesi Crosse 1863. Pl. 1, fig. 5. "Yates' Clanculus." Rather deeply and very narrowly umbilicated, conical, solid, rather thick; white, with numerous spots of carmine red, which at times become confluent; spirals with granular zones, forming as it were series of small pearls, obliquely and very finely striated in the parts which separate the zones; suture rather distinct; protoconch of two whorls, white, smooth; adult whorls about three, flat; penultimate, also last whorl, have each five granular zones, the ones nearest the suture being larger, and more projecting than the others, which renders the spire slightly stair-like; last whorl angular, rather flat on the basal side, with six rows of granulations around the umbilicus; aperture oblique, somewhat square, nacreous, ridged within, the ridges cease before reaching the outer margin, and form at the point where they stop, small denticulations; umbilicus white, surrounded by granulations; columella rather wide, with two folds, one near the umbilicus and inconspicuous, the other much stronger, weakly bifid; basal margin with some obsolete granulations; outer lip thickened, but only inside, and its edge almost acute. Height 8, greatest diam. 11, least 9.5 mm. Rather common, beach, all along the South Australian coast, and dredged alive to 22 fathoms. Also Western Australia—Bunbury Beach. (Type locality—Gulf St. Vincent). Crosse, at the same time, described—*var. B*. A little larger, more depressed, suture more distinct and as though canaliculated, spots more confluent, and of a rosy colour around the umbilicus. Height 8, greatest diam. 13, least 11 mm.

The species may be divided into a number of variants:—

1. Very depressed, very gradate; gradation formed by projecting supra-sutural spiral, a flat cancellate infra-sutural surface, and an angulating beaded spiral; in last whorl three fine granose spiral threads on the slope with an intervening threadlet in the interstices; large carinating peripheral spiral; this and the angulating spiral are closely tuberculate and multispirally incised; base flatly convex; seven spirals, the central the largest, that bordering the perforation smooth, the rest granose, minutely curvedly radially striate.

2. Similar, but whorls not so widely gradate; spiral threads larger and more largely granulate, the threadlets are granulose cinguli; the basal spirals are larger grained.

3. Whorls less stepped; the infra-sutural spiral has larger tubercles which occupy about one half of the flat surface; the peripheral spiral has rather larger tubercles than 2.

4. Depressed, gradate, with a spiral of small tubercles between the suture and the angulating spiral of large tubercles, (one has three marked tubercles in the umbilicus within its border).

5. Less depressed, less gradate; two rows of step tubercles as in No. 4; five rows of tubercles on the slope between the angulating and peripheral spirals, (one has rather larger tubercles all over it).

6. Like 5, but with only the angulating spiral tubercles on the step, which is less wide.

7. More solid; single row of large tubercles, infra-sutural, larger and less numerous than the peripheral; three rows of well-marked tubercles between six basal spirals, close large tubercles; perforation bordered by a smooth angle, within this are two distant tubercles; a winding spiral in the perforation joining the reflexion of the columella in a little tubercle above the basal columellar tooth; mouth very denticulate; whorls may be somewhat concave instead of straight sloping owing to comparative prominence of the two large rows of tubercles.

C. conspersus A. Adams 1851. "The Besprinkled Clanculus." Trochiform, reddish, variegated white and red; spirals necklace-like, spiral next beneath the suture the largest; last whorl angulated at the periphery; columella boldly plicate anteriorly, subcanaliculately tortuous above; outer lip validly dentate-lirate within. Height 11, diam. 13 mm. South Australian beaches, generally with *C. yatesi* Crosse. (Type locality—Gulf St. Vincent, under stones below tide marks). A trochiform coarsely granular shell, with last whorl subangular, variegated red and white; toothed on the inner lip; whorls about four-and-a-half. This is probably but a variant of *C. yatesi* Crosse. The *conspersus* and *yatesi* forms are most common on the beach, while the form *menkei* is that most commonly dredged in deep water.

C. menkei Adams & Angas. "Menke's Clanculus." Tate writes:—"Clanculus *yatesi* Crosse!, October, 1865 = *C. menkei* Adams & Angas, in British Museum." South Australian shells identified as *C. menkei* by Vereo after comparison with British Museum specimens, differ from true *C. yatesi* as follows:—

Rather more depressed, more validly gradate spire giving the sutures a deeper appearance, sculpture more delicate, granules on spirals smaller and more numerous, subsutural carina less marked, its granules little coarser than those of the remaining spirals; colour, cream, with rosy red, delicate, confluent blotches on the whorls and base. *C. menkei* may be described as a more delicately sculptured and coloured shell than typical *C. yatesi*.

This description recalls that of *C. yatesi* Crosse Var. B., Gulf St. Vincent. 14 fathoms; also MacDonnell Bay, Robe, and Beachport, 150 fathoms.

C. raphaeli Tenison-Woods 1876. "Raphael's Clanculus." Small, depressedly conical, rather solid; blackish olive, but tessellated with white at sutures; whorls four to five, flattened, girdled with irregular spiral granulo-lirate, sometimes alternating and sometimes with minute granulo-lirate lines intervening, granules larger at the margins; shell covered all over with minute transverse oblique lines; last whorl subacutely angular at the periphery; suture canaliculate; base flattened, ornamented with spiral granulo-lirate lines and oblique striae; umbilicus white; mouth quadrate, silvery, pearly, conspicuously lirate; columella wide, conspicuously tuberculate anteriorly; lip dentate. Height 6, diam. 6 mm. Beach, Gulf St. Vincent. (Type locality—George's Bay, Tasmania). This is probably a variant of *C. yatesi* Crosse.

C. philomenae Tenison-Woods 1875. Depressedly conical, white; whorls five, at the suture canaliculate, concave, with both margins beaded, within the margins three to four lirate; lirate with round shining granules, interstices very finely obliquely striate; last whorl acutely angulate and margined; base flat, spirally granulo-lirate; aperture obliquely squared; outer lip lirate within; columella unidentate and corrugated; umbilical margin spirally dentate. Height 10, diam. 11 mm. Gulf St. Vincent. (Type locality—Tasmania). A very distinct white shell with moniliferous whorls rising in stages. (Tenison-Woods). This also is probably a variant of *C. yatesi* Crosse.

C. purpuratus Pilsbry 1889 (= *C. yatesi* var. *purpuratus* Pilsbry). "The Purple Clanculus." Smaller but more solid than *C. yatesi* yet rather larger than *C. dunkeri*; uniform deep purple; uppermost lirate of granules much the largest, so that the upper part of each whorl projects abruptly beyond the lower part of the whorl above, as in *yatesi*, which character separates it from typical *dunkeri*; mouth oblique; columella subcanaliculate posteriorly without teeth on its free edge, has a large sometimes bifid tubercle at anterior extremity; outer lip lirate-dentate all round and is thick and the aperture somewhat contracted by the dentations; even when quite small the mouth has the above characters, whereas in *yatesi* the shell is nearly full grown before mouth is well formed. Height 8, diam. 11 mm. Gulf St. Vincent to Streaky Bay, beach and dredged to 55 fathoms. (Type locality—Tasmania). Like *C. yatesi* Crosse, this shell has two well tuberculate ribs and three less tuberculate between; the mouth however is rather more strongly dentated.

C. aloysii Tenison-Woods 1875. Conical, carinated, whitish or horny marked above with zigzag radiating stripes (sometimes broken into dots) of sepia or black, below unicoloured white or sparsely dotted with black, peripheral carina with a series of black spots; spire rather straightly conical, apex acute, whorls about six, sutures subcanaliculate; upper surface with coarse, conspicuously granose lirae, the first and sixth (or peripheral) being most prominent; base slightly convex, bearing six to seven concentric coarse, conspicuously granose separated lirae; mouth rhomboidal, outer lip iridescent and plicate within; basal margin rounded, denticulate; columella oblique, nearly straight, slightly folded above, bidentate at base; umbilicus (in adult) with a crenate marginal rib, white within; and perforating scarcely deeper than the insertion of the columella. Height 8, diam 6 mm. Beach, Gulf St. Vincent, Guichen Bay, MacDonnell Bay, Yankalilla Bay. (Type locality—Tasmania). Tenison-Woods summarised it—a small species, quite distinct in the black and white coloration. Some shells from MacDonnell Bay are red spotted, others black. There are variations in sculpture similar to those in *C. yatesi* of which we consider it only a colour variant.

C. philippii Koch (*Trochus*). Conical, perforate; fuscous, marbled with purple or white; whorls plane, with a series of nodules at the suture, then three or four series of granules, the last angulated; base plane, with seven rows of granules; mouth rhomboidal; lip lirate within; columella oblique, subsolite above, terminating below in an acute tooth. Height 11, diam. 12.5 mm. Beach, Hardwicke Bay, Port Lincoln. (Type locality—Adelaide). The whorls are flat, but appear terraced because a nodose carina projects on the upper part, below the sutures; below this are two or three minutely granose spiral lirae, and one more strongly granose, forming the angle of the last whorl; colour seems to be quite variable, some examples are brown, with large white spots and dark purplish-red granules, others are reddish brown, with white and purple granules. Probably a variant of *C. yatesi* Crosse.

C. ringens Menke 1843 (*Monodonta*) (not *M. ringens* Philippi 1846, preoccupied, a synonym of *C. personatus* Philippi 1847). "The Ringent Clavellus." Perforate, conical; whorls seven, the first smooth, yellowish, following planulate, separated by canaliculate sutures, maculate with chestnut and white; spirally cingulate above with four elegantly granulose ridges, the upper and lower the larger, last whorl acutely carinated; base slightly convex, with eight to nine granose cinguli; mouth rhom-

boidal, oblique, narrow; basal margin sulcate-denticulate; columella strong, oblique, terminating below in a large tooth, ringent above; columella callous, ringent, plicate. Height 10, diam. 11 mm. Point Sinclair (typical); Streaky Bay (Tate), Edithburgh (Matthews), a series of four approximate to Pilsbry's illustration, although they seem closely allied to *C. yatesi* Crosse. Western Australia—Geographe Bay. Yallingup, Ellensbrook, Bunbury, Rottnest Island, not uncommon. (Type locality—Australia, Western Coast. We designate Geographe Bay). Distinguished by the conical form, not depressed or gibbous like the majority of *Clanculus* species. It is sometimes quite narrow, the height greater than the diameter.

C. dunkeri Koch 1843 (*Trochus* [*Monodonta*]). Pl. 1, fig. 6. (= *C. rubens* Angas 1865). "Dunker's *Clanculus*." Orbicularly conoid or subdepressed, thick, solid, having a little hollow or depression at the place of the umbilicus; pale brownish-red, tubercles darker; obliquely striated, and with spiral granulose lirae, three on the penultimate whorl, eight or nine on the last whorl, of which the first is composed of larger beads, and the fourth forms the periphery, the interstices almost as wide as the lirae; whorls five, the first whitish, often eroded, the last brownish purplish or red; last whorl somewhat gibbous and descending towards the aperture, which in adult specimens is somewhat contracted and sub-trigonal; outer lip terminating in a small denticle, columella short, concave, smooth, terminating in an acute narrow denticle, which is separated from a similar smaller tubercle on the base by a narrow notch. Height 8, diam. 11 mm. Common on all South Australian beaches, and Western Australian as far as Albany; also dredged alive to 10 fathoms, and dead to 35 fathoms. (Type locality—Adelaide). The species is nearly conical; beach shells reddish, live ones much darker; mouth and about the umbilicus pure white; interior nacreous; whorls five to six, faintly convex, and wound round with rows of nodules, except the smooth protoconch; last whorl well rounded, base convex; mouth rhomboidal with rounded angles. Allied to *C. yatesi* Crosse, but more solid, less keeled at the periphery, spiral lirae fewer. Umbilicus very shallow for the genus.

Edithburgh 9 fathoms, three examples immature. When young there are four spirals of relatively large tubercles, the largest being around the perforation. As the shell grows the base becomes rounder and the tubercles, compared with those on the spire, increase more rapidly in size though still remaining smaller than the infra-sutural row; they are of a bluish-black colour. Also—Kingston 3, black with a reddish tinge, four spiral lirae and five basal, but between the former near the aperture

is an intercalated line of small tubercles, and between two of the basal spirals. Beachport, 40 fathoms, 7 dead rolled and stuffed with sand and smaller shells. Cape Borda, 55 fathoms, 52, all immature but one, dead, and largely filled with sandy mortary material.

C. plebejus Philippi 1851 (*Trochus*) (= *C. nodoliratus* Adams 1851). "The Plebeian Clanculus." Small, depressed, umbilicate; pinkish brown, gray or yellow, the ribs articulated with dots of black and white, often forming radiating lines above, zigzag beneath, where yellow replaces pink in the ground colour; spire low conic, protoconch acute; whorls about five, coarsely lirate, sutures subcanaliculate; body whorl obtusely angular at periphery, its upper surface encircled by four coarse, somewhat beaded lirae, the upper two contiguous, the third separated by wide intervals above and below it, the fourth peripheral, usually formed of two ridges close together, the interstices bearing numerous fine spiral striae, and sharp microscopic incremental striae; base convex, concentrically sculptured with numerous (six to nine) smooth striae, in the intervals between which very numerous microscopic striulae revolve; aperture rounded, oblique, outer and basal margins thickened, and minutely crenulated within; columella oblique not tortuous above, nor entering the umbilicus, but inserted upon the side; front edge nearly straight, denticulate at the base; umbilicus wide, not very deep, its margin somewhat denticulate. Height 7, diam. 10 mm. Beach, not uncommon, from Glenelg River, South Australia to Fremantle, Western Australia, also dredged to 40 fathoms. (Type locality—South Australia). When typically developed it is easily recognised by the very coarse sculpture of the upper surface, and the minute concentric striation of the base and interstices. Alive under stones beyond tide marks.

C. consobrinus Tate 1893 (*Clanculus*). "The Cousin Clanculus." Pl. I, fig. 4. Depressed, umbilicate; pinkish brown, sparsely black dotted; granulose lirae, four on penultimate whorl, equal and equidistant, and obliquely transverse raised threads; on body whorl, a small granulose lira between third and fourth, the fifth lira is slightly granulose, whilst the sixth (at the periphery) is broad and obtuse; interspaces between lirae are faintly spirally striate; base with seven concentric lirae, outer ones plain, others subgranose, with a few coincident striae in the interspaces; spire, low, conic, protoconch acute; whorls five, suture subcanaliculate; body whorl obtusely bi-angular at the periphery, base somewhat convex; aperture rounded, oblique;

outer and basal margins lirate-dentate; columella oblique, neither tortuous above nor entering the umbilicus; its front edge plain, except a tooth at the base; umbilicus wide and deep, its margin crenate-dentate. Height 8, diam. 14 mm. Not uncommon, beach, Holdfast Bay, Port Willunga, Normanville, Corny Point, Venus Bay, Point Sinclair, St. Francis Island; and dredged to 30 fathoms. Also Western Australia—Bunbury, Geraldton, Yallin-gup, Rottnest. (Type locality—Holdfast Bay, South Australia.) Type in South Australian Museum.

Slightly more depressed than *M. plebejus*, but much larger; umbilicus deeper, reaching to or beyond the junction of the penultimate and last whorls; the absence of trenchant tessellated sculpture and the equidistant granular lirae of the posterior area of the body whorl are distinctive characters.

C. multica rinatus Tenison-Woods 1876 (*Gibbula*) (= *C. angeli* Tenison-Woods 1876). "The Many-keeled Clanculus." Small, solid, orbicular, depressed, shining; pale chestnut, more or less spotted and clouded with brown; whorls four, keeled and lirate (four keels in last whorl); interstices lirate; keel at periphery somewhat larger; granular and regularly brown spotted at suture; protoconch white, smooth; base convex, rather distantly lirate; umbilicus spirally striate with a white margin; mouth subquadrate; outer lip produced, thin; columella rather thick and obsoletely tuberculate. Height 5.5, diam. 8 mm. Uncommon, Encounter Bay, Gulf St. Vincent. Also Geographe Bay, Western Australia. (Type locality—North-west coast of Tasmania). *C. angeli* (Type locality—Long Bay, Tasmania, 10 fathoms) is the deep water form.

C. denticulatus Gray 1827 (*Monodonta*). Pl. 1, fig. 7 (= *Jupinus* Philippi). Depressed, conical; pale reddish, with rows of white and brown spots; spirally grooved; ribs slightly granulated; sutures distinct, impressed; the lower part of the last whorl nearly smooth; umbilicus white, smooth inside, the edge furnished with a series of granules; mouth subquadrangular; outer lip crenulated at edge; columellar lip smooth, with a large tooth on the inside and a little roughness on the outer side. Height 7.5, diam. 10 mm. Not common, beach, Brown's Head, Royston Head, Yorke Peninsula (Weeding). Also Western Australia—Bunbury, Rottnest. (Type locality—Western coasts of Australia). This is one of the many cases of Western Australian shells being found as far east as the west coast of Yorke Peninsula but not beyond.

C. ochroleucus Philippi (1853) (*Trochus*). Conoidal, isabella-yellow; lirae, very fine, subgranose, about eleven on penultimate, forty on last whorl; whorls rather convex, the

last scarcely angled; margin of umbilicus dentate; columella very oblique, not solute above, terminating below in a simple denticle; lip thickened and corrugated within. Height 8, diam. 12 mm. Uncommon; beach, Pt. Willunga, Second Valley, Middleton, Normanville; dredged, Backstairs Passage, Gulf St. Vincent, to 20 fathoms. (Type locality—unknown. We designate Middleton, Encounter Bay, South Australia, where typical examples are common).

There are six to seven rather rounded whorls, last whorl scarcely angulated, and with a rather convex base; spiral cinguli on the upper whorls are distinctly granulose, on the last almost entirely smooth; umbilicus rather narrow, its margin dentate; columella very oblique, not free above, with a small but prominent denticle below; outer lip thickened within; with five folds, but near the edge with numerous wrinkles. The margin of the umbilicus is not in the slightest degree dentate in immature shells, it is only when the mouth is fully formed that the dentate margin exists, and appears to be only a dentate or granose edge of the apertural callus, traceable all around the mouth.

C. leucomphalus Verco 1905. Depressed conic, rather thin; light ashen-grey, with obscure flames of deeper grey or buff, and with numerous small pink dots on the second and third whorls; umbilicus and its margin pure white, throat nacreous green; spirals of smooth ovate granules, eight, close set, on penultimate whorl; ten spiral rows of granules above the acutely angled periphery of the body whorl, the granules of the infra-sutural row much larger and placed axially, the rest spirally ovate; ten rows on base of flatter, more quadrate, and more close set granules; axial striae, oblique, crowd between granules on spire, but obsolete on base; aperture quadrate oblique; outer lip crenulate, toothed just within the margin opposite each spiral lira, within this thickened and wrinkled, and in the throat lirate and nacreous; basal lip crenulate, thickened within with five teeth gradually enlarging towards the columella; columella oblique, nearly straight, ending below in a prominent, obliquely furrowed but not bifid tooth, a large tubercle at the junction of its upper and middle third, and with a flange throughout its whole length bent towards the umbilicus; umbilicus wide and deep, with a funicle winding up its outer side to the tubercle on the columella; umbilical border overhangs, with six tubercles, and margined by a flat, axially incised, spiral lira, with a threadlet on either side. Height 8, diam. 9.75 mm. Backstairs Passage, dredged alive 20-23 fathoms, dead in 6-23 fathoms (Type locality); one specimen from Levens Beach, height 12, diam. maj.

13.5, min. 12 mm (Cotton); dredged, 40 miles west of Eucla, 72 fathoms, one, 8.5 x 11.5 x 10.5 mm. (Verco).

C. clangulus Wood, from New South Wales, differs in having a more sinuous columella, due to a large tubercle at each end, and a median bulge, only six lirae on penultimate whorl, stouter and fewer lirae in the throat, a less rounded periphery, its colour light pink, with pink spots on base, and articulated deep pink just above and below the suture, and green and red tints instead of light ashen-grey with darker buff flammules.

ADDITIONS TO OUR LIBRARY.

1. Journal of the Royal Society of W.A. Vol. XVIII, 1931-32.
2. The Victorian Naturalist, number to March, 1934. The January number has a most interesting and well-illustrated article on the Mallee Fowl, while the Feb. No. with its copious illustrations is largely devoted to Orchids; a new orchid is shown by a colour-plate and the Sun-Orchids are depicted in unusual photographs.
3. The North Queensland Naturalist sends a leaflet continuing its census of North Queensland Plants.
4. The Coccidae of the Casuarinas. By Walter W. Froggatt, N.S.W. Linnean Society.
5. The Queensland Naturalist, September, 1933.
6. The Australian Naturalist, Feb., 1934.
7. The S.A. Ornithologist, Jan., 1934.
8. "Australian Grasses and their Economic Value." By J. W. Audas, F.L.S. Melbourne.
9. "A Botanist in the Blue Mountains," by J. W. Audas, F.L.S.
10. "Trees, and their Place in Nature," by J. W. Audas, F.L.S.
11. "Australian Vegetation," by J. W. Audas, F.L.S.
12. "Botany and its Economic Value," by J. W. Audas, F.L.S.
13. "The Great Ocean Road," by J. W. Audas, F.L.S.
14. "Australian Oaks," by J. W. Audas, F.L.S.
15. "A Valuable Swamp Grass," by J. W. Audas, F.L.S.
16. "Alien Plants recorded as Naturalised in Victoria," by J. W. Audas, and P. F. Morris, Field Naturalists' Club of Victoria.
17. "Some Victorian Geraniaceae," by P. F. Morris, National Herbarium.
18. "A New Species of Brachycome," by P. F. Morris, National Herbarium.
19. "Natural History," Journal of the American Museum of Natural History, N.Y., Feb., 1934.
20. The Australian Museum Magazine, March No. "Wild Nature in North Australia," by Chas. Barrett, is one of the most interesting of many fine articles.
21. Transactions and Proceedings of the Royal Society of S.A., Vol. LXVII, 1933. Our members will find in this volume a collection of important papers in every branch of Natural History. Members of the Section comprise the greater number of the contributors.
21. "Genus of the Bush," by Chas. Barrett. In this profusely-illustrated publication, Mr. Barrett deals with the Orchids and Birds' Eggs of Australia. There is a wealth of illustrations, many of them in colour. The notes on the various orchids, eggs, and toadstools are particularly well done. It is a marvellous production for the small price of sixpence.

BOTANISTS AND THEIR WORK.

By J. M. BLACK, A.L.S., *President of the Royal Society of South Australia.*

I am to speak tonight on "Botanists and their Work", but naturally I can only refer to a few of them—a few who may perhaps have some special interest for you—because the number of botanists in the world to-day is prodigious. To assure yourselves of this fact you need merely glance at the "Botanists' Address Book", prepared under the auspices of the Cambridge Botanical Congress and published quite recently. If you should be sufficiently interested to turn over the pages of that book, one fact may strike you as peculiar. There are more pages devoted to botanists and botanical institutions in Soviet Russia than in the United States of America. And when you remember that in the one State of California there are three great universities, each with its botanical department, you will realise the greatness of the pretensions raised in the Address Book on the strength of statistics supplied by the Soviet Government. According to the figures supplied, this country of Russia, depicted in such deplorable terms by every independent investigator from Western Europe, simply swarms with universities, phytologists of every description, botanical gardens and experimental stations of all kinds. I will only say that it is curious, if not significant, that at the International Botanical Congress held at Cambridge in 1930, there was not a single representative of these allegedly numerous and enthusiastic Russian botanists, although every other country in the world was well represented.

The earliest botanists were the herbalists who gathered plants used in medicine. Such research must have begun when humanity was still in a savage state. We know how our own aborigines, always hungry, devour roots, juicy fruits, crush seeds for food and chew leaves of certain species of *Nicotiana* and *Duroisia* as narcotics. While thus engaged they would find, or imagine they found, that some plants would cure diseases and that with others an enemy could be quickly and surreptitiously put out of the way. Think of the enthusiasm aroused in that South American tribe, when it was discovered that a resinous substance called curare, rubbed on the point of an arrow, would cause almost instant death. How superior to the old style of dipping the arrow-head in some decayed carcase and then trusting that the recipient would die slowly of blood-poisoning. One can imagine the king and council of that tribe greeting the discoverer of curare with the same enthusiasm as European military men displayed towards the genius who invented the explosive

shell, by which 20 or 30 men could be killed or disabled in an instant, and which was so superior to the old cannon ball which could only knock off one head at a time.

Some of the herbalists were also botanists, but their main interest was in plants which provided vegetable drugs. The first scientific botanist was unquestionably Theophrastus, who lived in the golden age of Greece and was a pupil of Plato and Aristotle. That was about 300 B.C. He is said to have reached a great age; some accounts give him over 100 years, and his final complaint was about the shortness of human existence, his opinion being that it ended when a real insight into its problems was just beginning. If he did not invent the saying, "Art is long, life is short", he might well have done so. We are chiefly interested in two of his many works—"The History of Plants" and "The Causes of Plants." He inherited a garden near Athens from his master Aristotle, and there he grew and studied plants. His simple and accurate descriptions of those which he knew can still be admired by modern botanists. He distinguished plants, just as we do to-day, as woody or herbaceous, and the herbaceous forms he classified as annual, biennial and perennial. Sepals and petals he regarded as modified leaves. Stamens he called "capillaries", no doubt from the hair-like filaments on which the anthers are usually mounted, and he recognised that the flowerheads of Composite plants consist of many separate flowers. He applied the word "fruit" to any vessel containing the seeds and he coined the word "pericarp" for the wall enclosing the fruit—all exactly as we do to-day. If he had possessed only a pocket magnifying glass, he would probably have discovered many things which were not known for long ages afterwards. The very modern branch of plant ecology was not unknown to him, for he describes the association of plants in woods, marshes, rivers, etc. He devotes a whole book to different timbers known in Greece. He had the scientist's dislike of allowing fancies to take the place of facts. He stigmatised as fabulous one superstition of his day—that wheat can be grown from barley seed, or vice versa. As Dr. Harvey Gibson says in his "Outline of the History of Botany,"—"there was not another pure botanist after Theophrastus for 18 centuries."

After that we have a succession of physicians who wrote on drugs and described some of the plants from which they were derived. Dioscorides and Galen, who came several centuries after Theophrastus, belong to this class, and when the Roman Empire collapsed and Europe entered upon that dark and dismal

period known as the Middle Ages, all scientific research was discouraged, nay, it became even dangerous. It is true that in medicine, architecture, and agriculture the Arabs kept the torch of science burning for several centuries, but in botany they did little but copy from the Greek authors who had preceded them.

The first herbalists who appeared towards the close of the Middle Ages were Italians and after them came the Germans, the English and the Dutch. One of their best points was that they published original drawings of the plants which they described, but as they usually merely copied descriptions from Dioscorides or Theophrastus, they sometimes fitted the drawings to the wrong description or vice versa. And they had not altogether freed themselves from medieval superstitions. For instance, Bock, a German herbalist, maintained that orchids have no seeds and that new plants arise from the excreta of birds.

The foremost place among them should probably be held by Valerius Cordus, born in 1515 and a student at Wittenburg. Wittenburg, as you will all remember, was the university of Hamlet and Horatio. It was a famous German university in Shakespeare's day. Founded in 1502, it ended by being transferred to the neighbouring town of Halle in 1815. "The pre-eminence of Cordus," says a biography, "rests on the fact that he was the first to teach men to cease from dependence on the poor descriptions of the ancients and to describe plants anew from nature." He published his "History of Plants" at the age of 25, describing between 400 and 500 species. Then he went to Italy to study a southern flora, but died of malaria at Rome when only 29 years old. He solved to some extent a question which had puzzled all his predecessors—the method by which the ferns multiply. He says that the fern reproduces itself by means of the dust which is developed on the back of the leaves. We call that dust "spores" to-day.

A long step forward was made by John Ray, an English puritan divine, who studied plants near Cambridge. He used the number of cotyledons (these are the small seed-leaves which first appear above the ground after most plants have germinated) as a means of distinguishing two large groups of plants and it is to him that we owe the terms Monocotyledons and Dicotyledons. In 1690 he published a small book which he called a "Methodical Synopsis of British Species." This was really the first British flora. By this time the microscope had been invented and lent immense aid to botanical research.

Sweden had not hitherto taken a leading part in the science, but now appeared the "Father of Modern Botany," Carl von Linné, usually known in English-speaking countries by his Latinised name of Linnaeus, 1707-1778.

He was the first to invent, or at least to systematise, what is known as the binomial nomenclature. That is to say, he gave to each plant a generic name followed by a single specific one. Thus each plant has two names and no more, the first one indicating the genus, or larger group to which it belongs, and the second one distinguishing it as an individual in that genus. To give one example: a small medic, popularly known as Black Medic, from the colour of its pods, introduced in Australia and now quite common, was called by early botanists *Trifolium pratense luteum capitulo brevior*, i.e., "Yellow Meadow Clover with a shorter flowerhead." Linnaeus cut this down to *Medicago lupulina*, and I think you will agree that it is an improvement. He travelled and botanised in his own country, in Holland, Germany, France and England, but he did not learn any modern language beyond his native Swedish, finding that Latin, in which all his own works were written, was usually a sufficient means of intercourse with his brother scientists. When visiting England he is said to have come upon a heath covered with gorse in flower—a shrub unknown in Sweden—and to have thanked God that he had been allowed to see a sight so beautiful.

You are probably saying that we have heard enough about botanists of the Old World and should turn to those who have concerned themselves with the Australian flora. There were great men before Agamemnon and there were several botanists—Sir Joseph Banks, Dr. Solander and the two Forsters, father and son, besides the Frenchman, Labillardiere, who visited and botanised in Australia before Robert Brown, but the latter is of most interest to us because he was the first botanist who landed in South Australia. That was in January, 1802—132 years ago. The son of a Scottish minister and a former student of the University of Aberdeen, he was appointed, through the influence of Sir Joseph Banks, as botanist to the expedition which sailed from England to explore the coasts of Australia in 1801. The little vessel which carried them was called the "Investigator", and the captain was Matthew Flinders, whose recently erected statue on North Terrace we have all admired. If Flinders was the perfect seaman and marine surveyor, Brown was the perfect botanist. The expedition approached our coast—then quite unknown—from the West and the first landing-place was Fowler's Bay and the date was January 29, 1802. "The botanical gentlemen landed early in the morning to examine the productions of the coun-

try," says Flinders in his log. "The botanists found the scantiness of plants equal to that of the other productions." It should be explained that the "botanical gentlemen" were Robert Brown and Ferdinand Bauer, the natural history draftsman who had also been chosen by Sir Joseph Banks. "The scantiness of plants" can well be imagined by those who have visited the shores of the Great Australian Bight in summer. And yet Brown collected and named several new species, principally among plants of the saltbush type, which can endure heat and drought. He continued thus right round our coasts, making exhaustive collections wherever he landed. The Murray Pine (*Callitris glauca*) was discovered and named by him near Port Augusta. Further south a dramatic incident occurred, to which Encounter Bay owes its name. There, on the 8th April, 1802, a strange sail was sighted which proved to be a French exploring ship, the "Geographe," under command of Captain Baudin. When Flinders sailed from Spithead on 18th July of the previous year, England and France were still at war, but both commanders were supplied with passes by their respective Governments, certifying that their task was a purely peaceful one. As a matter of fact the Peace of Amiens had been patched up just a fortnight before the meeting in Encounter Bay, but of course neither captain knew this. The French vessel flew the tricolor and an English Jack, while the "Investigator" hoisted the British colours and a white flag. Flinders cautiously kept his broadside turned to the stranger until his pacific intentions were evident and then lowered a boat and went aboard. He took Robert Brown as interpreter, but his services were not required, as Baudin spoke English after a fashion, and a friendly interview took place. Flinders and Brown were shocked to see the state to which the French crew had been reduced through scurvy, owing to their diet of salt meat, weavily biscuits and bad water. The English captain insisted on scrupulous cleanliness in his own ship, served out lime juice to his men and got fresh meat or fish for them whenever it could be obtained. As a result his men were hale and hearty, while the French were so ravaged by scurvy that very few of the crew or officers saw France again. Baudin himself died in Mauritius shortly before the arrival in that island of Flinders, who was kept a prisoner by the French Governor for more than six years. Fortunately Brown did not accompany his old captain on that journey in the "Cumberland," smaller and even more leaky than the "Investigator," which had previously been condemned in Sydney as hopelessly rotten. Yet in the stuffy cabin of this little boat of 334 tons burden, Brown

dried, stored and wrote his notes on the vast collection of plants which he made all round the coasts of Australia. Both sailors and scientists were tough, much-enduring men in those days. He returned to England in 1805 and in 1810 he published his "*Prodromus Florae Novae Hollandiae*," which means an "Introduction to the Flora of New Holland," a very modest title for a work which was acclaimed with enthusiasm both in England and on the Continent. It named and described concisely a great number of Australian plants, the whole being arranged under natural orders or families, beginning with those which have flowers or fruits of the simplest structure; in fact, Brown's classification is much the same as that of the most modern floras. His 4 years of wandering round Australia appear to have satiated his appetite for travel and he spent the rest of his life quietly in London, engaging in all forms of botanical investigation and revered as the greatest botanist of his day.

The next botanist to achieve future renown landed in South Australia very modestly in 1847 in the person of Dr. Ferdinand Mueller, who had taken his degree as Doctor of Philosophy at the University of Kiel in the earlier part of the same year. His father and mother had died of phthisis in Germany and one of his two sisters was threatened with the same complaint, which was his reason for bringing them to a milder and warmer climate. This step was taken on the recommendation of Dr. Ludwig Preiss, who collected plants in Western Australia from 1838 to 1842, and who had returned to Germany. On the voyage to Australia Mueller was a fellow-passenger of Mr. Moritz Heuzenroeder, and on arrival he obtained a position as chemist in Mr. Heuzenroeder's shop in Rundle Street. Some of you, who, like myself, are not as young as we once were, may remember that establishment in the 80's and 90's, with its inscriptions of "*Deutsche Apotheke*" and "*Hiel spricht man Deutsch*." Young Mueller found time to travel to what was then the Far North (the Flinders Range and north of Quorn) and to the South-East always collecting, studying and describing our plants. Towards the end of 1848 he established himself on 20 acres of land in the Bugle Ranges, part of a block of land purchased by Sir Samuel Davenport, Mr. Krichauff (later a member of Parliament) and himself. He built a hut and installed his sister Clara as house-keeper, but farming did not suit him and he returned to Adelaide and resumed his favorite study of botany. When the gold rush came in 1852, he went to the Victorian diggings with the intention of starting a chemist's business on the field. Fortunately, this was not necessary, for Governor Latrobe, whose attention had

been called by Sir William Hooker, the Director of the Royal Botanic Gardens at Kew, to Mueller's meritorious work, appointed him Government Botanist of Victoria. His boundless enthusiasm found a vent in many journeys throughout the State, often undertaken alone and later travels carried him over the greater part of Australia. His publications, often illustrated, were very numerous and descriptions of new species flowed from his pen. He became a Fellow or an honorary member of many scientific societies. The King of Wurtemberg made him a "Freiherr" or Baron and Queen Victoria knighted him. He spent most of his salary in employing collectors of plants and when he was asked why he did not marry, he said his work left him no time for such a thing. For over 40 years he was the undisputed botanical authority in Australia.

Robert Brown's flora dealt almost exclusively with coastal plants, for the Blue Mountains had not been crossed in his day and all the inland parts of Australia were quite unknown. By 1860 it had become necessary to compile a descriptive list of all known Australian plants. This huge task was accepted by George Bentham, of whom a word must be said before closing this address. He had spent his youth on the Continent of Europe and had developed the same enthusiasm for plants as Brown and Mueller. He was a great, a judicious and a cautious botanist, untiring in his work. He had to examine all the types of Australian species, scattered as they were over many herbaria, and he had to study all the European collections, dating from the time of Cook's discovery of Botany Bay, as well as the vast store of plants sent to him in London by Baron von Mueller. That a good deal of his work, especially in certain genera, has undergone some revision in recent years, is nothing to be wondered at. Bentham laid the solid foundation for all floras of Australia. As has been well said, his was the task of rough-hewing the vast material into shape, leaving to later specialists the closer examination and often the re-arrangement of some of his species. His division of such great Australian genera as the Acacias and Eucalypts into series or sections is the work of a master and has been followed by all subsequent authors. The remarkable thing is the indifference which the colonial governments showed towards the *Flora Australiensis* after they had authorised its compilation by Bentham. One would have imagined that each State, realising the importance of the work, would have engaged one or two botanists or collectors to gather specimens in outlying districts. This was not done anywhere except in Victoria, where Mueller himself collected and also paid collectors out of his own salary. And this neglect was not due to the

fact that the *Flora Australiensis* cost the Australian Governments dear; their contributions towards its publication were so meagre that when the expenses of printing had been met, there remained for Bentham a remuneration at the rate of about £80 a year for 15 years of scientific labor. It seems incredible, but it is the estimate arrived at by Mr. B. S. Roach in a paper which he read to us a few years ago, and I believe it is quite correct. Fortunately Bentham was a man of independent means and his botanical work was a labor of love.

It would be impossible for me, without taking up too much time and wearying you too sorely, to do justice to the many other botanists who have worked on South Australian plants. We have not been visited by so many learned European investigators as the other States—Sieber in New South Wales, Domin in Queensland, Preiss, Diels, Pritzel and Ostenfeld in West Australia—but resident botanists have helped to elucidate our flora. The late J. H. Maiden, Government Botanist of New South Wales, an enthusiastic worker and a very lovable personality, specialised in Eucalypts and Acacias and visited our State more than once in connection with his researches. We have had amongst us for many years the leading Australian authority on Orchids—Dr. R. S. Rogers—and Mr. E. H. Ising, recently your chairman, has been a diligent collector of plants in all parts of the State and has also described several new species. In the Far North and the Far North-West, Professor J. B. Cleland and Messrs. H. H. Finlayson and N. B. Tindale have recently made very interesting notes and collections.

You will tell me perhaps, that I have said very little about the lives of botanists. Well—"happy is the nation which has no history" and perhaps this saying may be applied to individuals. It is true that some botanists have perished in "moving accidents by flood and field," especially in unhealthy tropical climates. While collecting plants in the interior of New South Wales in 1835, Richard Cunningham, brother of the Sydney botanist, Allan Cunningham, was speared to death by the natives. There is the story of Robert Brown, or some other early botanist, who was gathering a fine specimen on the Gulf of Carpentaria, when a spear whizzed past his ear. He ran a race with several other spears on his way back to the boat, but he brought the plant along with him. But generally speaking, botanists appear to have led very peaceful and uneventful lives—"along the cool sequestered vale of life they kept the even tenor of their way."

VOL. XV., No. 4.



September 20th, 1934.

THE South Australian Naturalist

THE JOURNAL OF THE FIELD NATURALISTS'
SECTION OF THE ROYAL SOCIETY OF SOUTH
AUSTRALIA AND OF THE SOUTH AUSTRALIAN
AQUARIUM SOCIETY.

Hon. Editors: Wm. HAM, F.R.E.S.,
and BERNARD C. COTTON.

The Author of each article is responsible for the facts and opinions recorded.

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Published Quarterly.

Price: NINEPENCE.

Obtainable from Rigby's Book Shop, Grenfell Street, Adelaide.

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Periodical.

FELSTEAD & OMSBY, PRINTERS, Delmont's Buildings, Anster Street, Adelaide.

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Bookings for the Special Excursions (marked with a star on the Programme) should be made with Mr. E. H. Ising, Railway Station. In the case of Motor Trips, ticket is to be paid for at time of booking.

EXCURSIONS.

- Sept. 8th—Blackwood. Train, 1.15 p.m. Botany. Mr. E. H. Ising.
Sept. 15th—Corramandel Valley, via Blackwood. Train, 1.15 p.m. Orchids.
Mr. H. Goldsack.
Sept. 22nd—Morialta. Tram, 2 p.m. Botanical Survey. Prof. Cleland.
Sept. 29th—Torrens Valley. Tram, 1.55 p.m. General. Mr. Wicks.
Oct. 6th—Belair. Train, 1.15 p.m.
Oct. 10th—Barossa, via Milbrook. Motor, 9 a.m. Mr. Ham.
Oct. 12th—13th Stow Church Hall. Wild Flower Show.
Oct. 27th—Mr. Ashby's, Blackwood. Train, 1.15 or 2.14 p.m. Cultivated
Flora. Dr. W. Christie.
Nov. 10th—Mt. Lofty. Train, 1.15 p.m. Heath Flora. Mr. E. H. Ising.
Nov. 17th—Marino. Train, 1.30 p.m. Shells. Mr. F. K. Godfrey.
Nov. 24th—Outer Harbor. Train, 1.35 p.m. Birds. Mr. Condon

EVENING MEETINGS.

- Sept. 18th—Conversazione. Covent Gardens. Lt.-Col. Fulton.
Oct. 16th—"A Pioneer Botanist." Mr. F. J. Cunningham. "A Private Observatory and its Work". Mr. R. C. Shinkfield.
Nov. 20th—"Collecting Wild Flowers." Mr. & Miss Burdett. "S. Aust. Hesperidae or Skippers." Mr. M. W. Mules.

The South Australian Naturalist.

Vol. XV. ADELAIDE, SEPTEMBER 20th, 1934. No. 4.

THE STUDY AND LOVE OF NATURE.

AN APPEAL TO YOUTH.

By C. FENNER, D.Sc.

Those who are interested in the study and the love of Nature are being at the present time somewhat exercised in their minds by an apparent falling off in the interest usually taken in such matters by a goodly proportion of young men and women. There are abundant signs of this failing interest. In the following notes an effort is made to set down some of the charms and delights that attend upon a love of natural history, and an appeal is made to young South Australian to turn their minds, now and then, towards the quiet contemplation of the world of cloud, and wave, and leaf.

While I am writing to you of these things, it is necessary for me to remember, and I want each reader also to realise it, that the potential Field Naturalists of South Australia live under many widely different conditions, with a great variety of natural surroundings. Some are fortunate enough to be living in the bush itself, others live by the seaside; many dwell in clearings in the graceful scrub of the Murray Mallee, or the far West Coast, and others on distant plains among the mulga and the salt-bush; still others live in settlements along the banks of the mighty Murray River, and many have their homes in the streets and suburbs of Adelaide. But each one, wherever his home may be, has the opportunity of studying natural history, and of taking some interest in the world around him.

You may not talk much, or at all, about the things that you love the best. Every youth and maiden, for instance, grows fond of the hills and valleys of his or her native place. They find a quiet pleasure in the trees and flowers, in the birds and other animals around them, and in the roads and fields and pathways over which they wander on those rare days when they are free, rambling or hunting or hiking, to go just where they like.

As they grow older they find that this love of native hills and plains will grow stronger and stronger, until it becomes one of the deepest feelings in their hearts. An English poet has said:

“God gave all men all earth to love,
And since man’s heart is small,
Ordained he, one spot should be
Beloved over all.”

We may ask: why is it that people love the earth, the rocks, the trees and the birds of their home land so well? Perhaps the answer is: Because they know them so well, so closely. This brings us to an important point. The more study we give to nature, the more pleasure we receive from her in return; the more we grow to know of her, the more our love grows. We usually associate study with books and with teachers. I want to emphasize the fact that Nature is one of the most wonderful as well as one of the kindest of teachers. Further, Nature is not only a teacher, but also a book—the greatest of all books, a volume full of beauty and humour and interest and inspiration. A great poet has said:

“In Nature’s infinite book of secrecy a little I can read.”

An “infinite book”! This means that it is a book that never comes to an end, and it is also a book of which the study never tires us. It is called also a book of secrecy. Nature’s book is not always easy to read: still, everyone can read some part of it, and if at times we learn some new thing, something new to us or to everyone, some secret of Nature, about bird, or leaf, or wave, or rock, or cloud.

We speak also of Nature as a Teacher; and she is indeed a patient and kindly teacher. She asks little; she sets no tasks; she gives no punishments; all she requires from us is our interest, that we notice the trees, the birds, and their nests, the flowers and their colours, forms, and habits; the glory of the clouds, the beauty of the waves, the colour and form of all natural things.

Happy indeed are those of our readers who live by the sea:

“The sea is a jovial comrade,
He laughs wherever he goes,
His merriment shines in the dimpling lines
That wrinkle his hale repose.”

Not only so, but the beach and the sand-dunes and the cliffs are wonderlands where the waves throw up ever-new samples of their wonders of shell and sponge and seaweed. We may not all care to collect these treasures, but we can at least notice them, admire the curve or colour of a shell, the delicate structure of a sea-weed or sponge, and the beauty of the pebbles or the sand-ripples.

Nor should those who live in the dry lands, far outback, be envious of their cousins at the seaside. There is a land of wonder in the mulga and the saltbush. An Australian poet tells us that on those distant plains they

“See the vision splendid
Of the sunlit plains extended,

And at night the wondrous glory of the everlasting stars.”
The desert lands hold strange treasure of bird and beast and insect and lustrous skies. Everyone, both young and old, who lives there is very close to nature in his everyday life. Many may have learned facts of natural history that are still unknown to the learned men who spend their lives studying these things. And it is their own watchful alert eyes and ears, their own tireless feet and hands, that have enabled them to learn it. They have read a little in the infinite book of Nature, and Nature herself has been the teacher.

But Nature is not only a book to read. She is not only a teacher to instruct. Nature is also a companion. She is one of the best of companions, for she asks nothing of you except your interest, she demands nothing of you when you are tired; she is ever ready to interest you when you feel so inclined; her companionship becomes more and more pleasant as the years go by:

“Nature never did betray the heart that loved her,
’Tis her privilege through all the changing years of
this our life,
To lead from joy to joy.”

We hear men speak of the Beauty and the Unity of Nature. Let us think for a few moments of these aspects of the world around us. It is easy, but not always easy, to understand the beauty of Nature. We know of the beauty of trees, and birds, and flowers, of skies and clouds and sunsets, of the restful beauty of the landscape, whether a mountain valley, or a wide Mallee plain, or a sunny sea.

But we may look for still further beauty—of a nest of speckled eggs, of the delicate veining of a leaf, of the curling tendril of a vine, of the curious ornamentation of a shell, of the play of light on the mountain side, or of the markings of a butterfly's wing. Then there is the beauty of adaptation, of the way in which all living things have adjusted themselves to their surroundings, the gnarled and bent tea-tree of the windswept coast is as beautiful as the majestic gumtree of the moist mountain valley, for each has adapted itself to its environment.

The arrangement of the humble mosses and lichens on the rocks is not less beautiful than is a summerhouse full of rare blooms. Note how cunningly and cleverly the rabbit selects the site for its burrow, the bird a place for its nest, or the moth a sheltered corner wherein to spin its cocoon.

Then again, Nature has many moods; in some moods she appears cruel and angry. But there is a beauty of night and storm and darkness, a beauty of the thunder and lightning, just as there is a beauty of her more pleasant and kindly aspects. Nature in all her manifestations is full of beauty and interest.

Now let us consider the Unity of Nature, that is, the Oneness of Nature, the way in which every living thing on the earth's surface is related to every other living thing. The insect is related to the flower, the bird is related to the tree in which it builds, the beetle is related to the plant on which it feeds.

Not only so, but all living things are made of the same materials, consist of the same cells, growing in the same way; all things, whether plant or animal, are most intimately related, all are part of the one great creation of which we also are part. And the wind and the wave, the rain and the sunshine, the rocks and the soils, are also related to each other, each depending upon the same soil, sunshine, and rain that support our lives, all the living things also depend for their existence. Thus we see that Nature is all One,—that there is indeed a perfect Unity in Nature.

I have spoken of Nature as a great Book to read, and also of Nature as a teacher and as a companion. And we have discussed in a limited way the Beauty and the Unity of Nature. In conclusion, I wish to suggest that you should cultivate the study of Nature, and I shall first tell you how to do this, and then why you should do it.

First, then, how to do it. Simply by looking about you. Notice the sunrise and the sunset, the clouds and the stars; not always, for that would be tiresome, but just now and then. Note the butterfly, watch her flight, discover her method of alighting and feeding. See the young green blades of grass as they grow; now and then stop for a moment to watch how they develop. Note the habits of birds and beasts, even of the rabbit and the fox that you hunt, or of the bird whose nest you discover. Just a little observation now and then. And it will bring you such pleasure, as the years go by, that the habit will grow upon you, so that your hikes and rambles will bring increased pleasure.

I have said I should tell you why you should do this. Firstly, of course, because we, you and I, are one with Nature, and we shall the better understand ourselves and each other the more we know of the world of living things around us.

And there is another reason. This is a world of change. Everything changes. Everything grows older. One by one everything passes away. All except one. The games you now love so much will one day grow tiresome; the books you take so much delight in will before long cease to attract you; the companions you have will find other paths to follow. But, you say, other games will give you pleasure as you get older, and other books and other companions.

That, too, is true. But these new pleasures will tire you in turn. And possibly these changing friends, and games, and work, and books, will always be the main things in your lives. Still, it is comforting to know, and we have the assurance in this of wise men and women of all ages, that there is one pleasure that never tires, one game that never grows old, one teacher that never leaves us, one pastime that is always new and fresh. And that is the study and the love of Nature.

In the troubled days in which we live it is particularly worth while to cultivate the habit of taking pleasure in the great book of Nature, wherein we may at all times find quietness and peacefulness and repose.

"If thou art worn and hard beset
With troubles that thou wouldst forget,
If thou wouldst learn a lesson that would keep
Thy heart from fearing and thy soul from sleep,
Go to the woods and hills. No tears
Dim the calm look that Nature wears."

SOUTH AUSTRALIAN SHELLS.

(Including descriptions of New Genera and Species).

(By BERNARD C. COTTON & F. K. GODFREY).

PART XII.

TROCHIDAE (Contd.)

Cantharidus Montfort 1810 (= *Cantharis* Férussac: = *Elenchus* Swainson 1840). Ovate-conic or pyramidal, not umbilicate; colours generally bright and variegated; smooth or spirally sculptured outside, brilliantly iridescent within; aperture less than half the length of the shell, longer than wide, ovate; columella more or less folded or toothed near the base. Type—*Limax opalus* Martyn 1784, = *Trochus iris* Gmelin 1790 (New Zealand). Distribution—Australasian seas, chiefly; in shallow water. Fossil—Pliocene. Animal with the eye-bearing peduncles long and the tentacles ciliiform; three pairs of epipodial cirri; foot short, obtuse behind. In the radula the central tooth has a body with broadly expanded supporting wings, a narrowed neck, which bears a simple cusp; this peduncle has on each side delicate wings. The lateral teeth, five on each side, increase in size from the inner to the outer one; this peculiarity, together with that of the central tooth, will enable one to recognise a radula of this genus at a glance. The inner lateral is slender, narrowed toward the cusp, like the centrals, and sometimes bears a lamella behind the peduncle. The outer laterals are very broad, with one or several denticles on the cusp. There are no jaws.

Cantharidus (subgenus). Shell rather thin, ovate-pointed, whorls striated or smooth; columella rather straight, simple, not toothed. (*L. opalus* Martyn, the type of the genus, is a New Zealand shell, large, up to 45 mm., obsoletely, distantly, spirally, grooved, whitish, with longitudinal zigzag markings of purple). *C. pulcherrimus* Wood, and *C. lehmanni* Menke with its variants *tesseuri* Fischer, *ramburi* Crosse, belong here.

Phasianotrochus Fischer 1885, (subgenus.) (= *Elenchus* H. & A. Adams). Thick, solid, polished, elongated; ovate-pointed; aperture ovate, longer than broad; columella arcuate, bearing usually a tooth-like projection in the middle. Type—*T. badius* Wood = *eximius* Perry, and its variants *peroni* Philippi, *gracilis* Anton, *leucostigma* Menke. Here may be placed *apicinus* Menke, *bellulus* Dunker, *irisodontes* Quoy & Gaimard, and *nitidulus* Philippi.

Thalotia Gray 1847 (subgenus.) Shell imperforate, elevated-conical, thick, solid, granulated or spirally ribbed; periphery rounded or obtusely angular; aperture small, ovate; outer lip thick, crenulated within; columella toothed at base, subtruncated. Type—*Monodonta conica* Gray 1826. In addition to the type—*conicus* Gray—we include *neglectus* Tate, *chlorostoma* Menke, *blandianus* Crosse, and *abnormis* Crosse.

Prothalotia Thiele 1930 (subgenus). Shell conical, thick, very narrowly perforate, columella smooth, concave, truncate below. Type—*C. flindersi* Fischer. With this may be grouped the South Australian species *freycineti* Fischer, *baudini* Fischer, *decoratus* Philippi.

C. pulcherrimus Wood 1828 (*Trochus*) (= *T. preissii* Menke 1843: = *T. puella* Philippi 1851: = *Thalotia maria*, Tenison-Woods 1877). Pl. 1, fig. 1. "The Fairest Cantharidus." Shell imperforate, acutely conical, elongated, thick, solid; spire straightly conical, apex subacute, sutures linear; whorls about six, nearly flat, the penultimate with four or five broad flat spiral ribs, often unequal in width, separated by narrow impressed grooves, the body whorl subangular, with four or five broad flat low ribs above the periphery and more numerous narrower ones on base; ribs usually purplish-crimson articulated with narrow white marks; aperture small, less than half the length of shell, oblique, oval, brilliantly iridescent and somewhat sulcated inside, peristome edged with a line of intense crimson, bordered with greenish inside; columella vertical, slightly arcuate, straight in the middle; parietal wall covered by a light callus. Height 14, diam. 9 mm. Beach, fairly common. Middleton, Glenelg (Gulf St. Vincent) to Geraldton (Western Australia). (Type locality—Southern Australia. We designate Encounter Bay).

C. lehmanni Menke 1843 (*Trochus*). Pl. 1, fig. 2. "Lehmann's Cantharidus." Imperforate, elongated conical, solid; whitish, or a little tinged with olive, with numerous rather narrow long olive-brown stripes, usually broken into tessellations at the base; spire long, protoconch subacute, whitish; sutures moderately impressed; whorls about seven, flat or concave below the sutures, convex and swollen at the periphery and above each suture, encircled by numerous fine lirae; last whorl a trifle deflexed at the aperture, often subangular at the periphery; aperture rhomboidal, less than half the total length of shell; peristome rather thin, acute, edged by a row of red dots, thickened a little distance within, the thickening finely crenulated; columella vertical, marked with crimson at the outer base. Height 13, diam. 10 mm. Beach, not uncommon, and generally distributed, from Robe (South Australia) to Geraldton (Western

Australia). (Type locality—South Australian coasts).

C. lesueurii Fischer 1880 (= *Thalotia picta* Angas 1865: not *Trochus pictus* Wood 1856). "Lesueur's Cantharidus." Shell carinate, finely spirally striated, peristome more or less red-edged; sometimes the colour streaks are quite broad; base usually finely tessellated, and the lower part of columella crimson; the umbilical tract tessellated pink and white. Height 16, diam. 11 mm. Common at Robe, and not uncommon on beach all round the coasts of South and Western Australia to Geraldton. (Type locality—South Australian coasts). This is but a variant of *C. lehmanni* Menke.

mm. Not uncommon, beach, common at Robe, and not uncommon.

C. ramburi Crosse 1864 (*Trochus*). Pl. 1, fig. 3. Rambur was a French palæontologist. Imperforate, pointed conical, solid, crimson with narrow radiating whitish flames on upper surface, usually extending to the periphery, and an umbilical tract of red and white tessellated; spire lengthened, protoconch subacute, sutures subimpressed; whorls about seven, concave below the sutures, convex and swollen at the periphery and on the lower edge of each whorl of the spire; whole surface finely spirally lirate, the lirae about as wide as the interspaces, which are obliquely striate; aperture oval-quadrate, iridescent within, less than half the length of shell; peristome edged by a row of crimson dots, with a porcellanous internal thickening which is finely crenulate; columella vertical, slightly arcuate, pearly. Height 13, diam. 8 mm. General, uncommon, beach, Beachport to Venus Bay. Also Western Australia—Mandurah. (Perth Museum). (Type locality—South Australian coasts). This shell is typically coral-red or crimson colour, flammulate above with whitish; fully adult examples often show the light flames only upon the upper whorls. We consider it only a straight-sided form of *C. lehmanni* Menke.

C. nitens Kiener (= *T. lepidus* Koch). "The Shining Cantharidus." Imperforate, conic-pyramidal, elongated, acute; shining, buff or ashen, variegated with minute spots of violet and white; whorls seven to eight; embryonic whorls smooth; the following planulate, sometimes prominent and dilated above the sutures, encircled by about six lirae, the interstices striated; last whorl carinated, encircled by a larger rib at the margin, slightly convex beneath, the whorl bearing eight beautifully red spotted concentric lirae; columella white, arcuate, dentate at base. Height 15, diam. 11 mm. (Type locality—Australian coast; Kangaroo Island). Specimens from Corny Point and Fremantle agree fairly well with this description and Pilsbry's figure. It may however be only a variety of *C. lehmanni* Menke.

C. eximius Perry 1811 (*Bulimus*) (= *B. carinatus* Perry 1811: = *T. badius* Wood 1818: = *T. lineatus* Lamarck: = *T. lividus* Kiener: = *Monodonta rosea* Lamarck: = *T. roseus* Philippi: = *fulmineus* Kiener: = *Elenchus splendidulus* Swainson: = *T. australis* Quoy & Gaimard: = *T. quoyi* Philippi: = *T. picifer* Fischer). Pl. 1, fig. 4. "The Exceptional *Cantharidus*." Shell imperforate, elongated-conical, solid, rather thick, polished, shining; brown, fawn, or rosy, with widely spaced light or dark narrow spiral lines, usually four on the penultimate whorl; surface faintly spirally densely striate; spire slender, straight-sided; apex acute; whorls seven, slightly convex, the last rounded at the periphery; aperture fully one third the total length, ovate, brilliantly iridescent within, and sulcate; peristome thickened, greenish; columella vertical, toothed below the middle. Height 28, diam. 13 mm. Beach, not uncommon, from MacDonnell Bay to Streaky Bay, including both Gulfs, and dredged alive to 20 fathoms. Also Western Australia—Eyres Sandpatch, Esperance Bay, Albany, Rottnest Island, Yallingup and Ellensbrook. (Type locality [*C. eximius*]—Tasmania). According to Hedley, this species spreads along the whole of extra-tropical Australia; Hedley saw it at Caloundra (Queensland), and May refers to it as common in Tasmania. The shape of the shell is moulded by its environment, for the mollusc lives not on rocks but ever aloft on swaying bands of kelp. The stream has no grip on the smooth lines of *C. eximius*, as it would have on a normal keeled pyramidal *Cantharidus*. Some land shells living on twigs and leaves have assumed a like form under like conditions (Hedley). This species is very variable in shape and size when adult, and in its colouration, as suggested by its many names, but all the variants graduate into one another. At Cerry Point two variants were taken. One livid brown colour with bluish nacreous aperture, the other rosy colour with reddish nacreous aperture, but there are many intermediates.

C. peroni Philippi (*Trochus*) (= *T. vermiculosus* Kiener: = *T. fulmineus* Kiener). "Peron's *Cantharidus*." Imperforate, elongate-conic, pointed, exactly like *C. eximius* Perry, in contour; polished, purplish-pink, darker towards the apex, with longitudinal zigzag or flexuous white lines or stripes. Height 30, diam. 14 mm. Beach, not common, from Beachport to Streaky Bay; and dredged, Investigator Strait, 20 fathoms. (Type locality—South Australian coasts). Appears to differ from *E. eximius* Perry, chiefly in the longitudinal white lines, and is but a variant of that species. *T. fulmineus* Kiener, is founded on a specimen with very numerous oblique lines.

C. leucostigma Philippi 1845 (Menke) (*Elenchus*). Pl. 1, fig. 5. "The White-branded Cantharidus." Slender, elongated-conical, solid, polished, imperforate; fawn coloured, protoconch darker, with radiating pure white or pink blotches, or sparsely scattered spots; all over very finely spirally striate and with distant superficial linear sulci, four to six on the penultimate whorl; whorls about seven, slightly convex; body whorl rounded or subangulated at periphery; mouth ovate, angular above, broadly rounded beneath, iridescent and sulcate within; columella arcuate, dentate below. Height 23, diam. 11 mm. (Type locality—South Australia. We designate Encounter Bay). A small variegated shell, mottled with red, white and olive; the interior of a pearly greenish blue colour. It may be a form of *C. eximius*.

C. gracilis Anton (*Trochus*). Pl. 1, fig. 6. "The Slender Cantharidus." Small, slender like *C. leucostigma* (*eximius*) but lacking white markings on the spire. Height 17, diam. 7 mm., or smaller. Like a miniature *C. badius* in colour. (Type locality—We designate Middleton, South Australia). Philippi noted that *C. gracilis* approaches nearly *C. bellulus* Dunker, in its turreted shape and the opening of the mouth: still somewhat narrower the individual whorls and certainly invalid, but distinctly rounded, and quite differently coloured; usually cross lines occur, five on the penultimate, ten on the last whorl; in fresh examples there are microscopic closely-crowded cross streaks; colour of shell olive-green, here and there with red and whitish streaks and spots; white streaks may be absent: throat white; mouth pearly green within. A colour variety of *C. leucostigma*.

C. apicinus Menke 1843 (*Monodonta*). "The Pointed Cantharidus." Imperforate, elongated, rather solid, smooth; shining, grayish, or brownish-yellow, with numerous narrow obliquely longitudinal red lines; whole surface microscopically spirally striate, the striae coarser on the base; whorls eight to nine, nearly flat, upper whorls lighter; sutures pink; spire turreted, straight sided, acute; sutures linear, sometimes white margined; body whorl rounded at the periphery; aperture slightly exceeding one third the total length of shell, oval, beautifully iridescent within, smooth, not sulcate; columella with a subacute tooth below the middle. Height 18, diam. 9 mm. Not uncommon, beach, from Robe (South Australia) to Rottnest (Western Australia); also dredged alive to 22 fathoms. (Type locality—Western Australia). The margin of the aperture for about two millimetres is generally white with fewer broader red lines, and on the base near the mouth the red and white may be more or less tessellated. There is often a narrow reticulated supra-sut-

ural band of reddish-brown and white, more marked in the upper whorls; sometimes this band is infra-sutural, and it may even be supra-sutural in the upper whorls and become infra-sutural in the lower. There may be in the upper whorls wide axial flames of short spiral white bars. The fine, crowded, oblique rust-brown longitudinal lines, are often hard to perceive on account of the golden and violet iridescence.

C. bellulus Dunker 1845 (*Trochus*). Pl. 1, fig. 7. "The Elegant Cantharidus." Imperforate, elongate-conic, acute, solid, polished; grayish or pinkish, with a few spiral red or orange lines, two on the penultimate whorl; the spaces between these lines marked with short white curved lines in pairs, often forming a figure 8-shaped pattern; whorls about eight, nearly flat, the last rounded at the periphery; spire attenuated toward the acute purplish apex; aperture small, contracted, sulcate and iridescent within; columella vertical, strongly toothed below. Height 15, diam. 7 mm. Beach, common, from Henley Beach (Gulf St. Vincent) to Fremantle (Western Australia); and dredged alive to 14 fathoms. (Type locality—South Australian coasts). A very attractive species. The interior of the mouth is more coarsely sulcate than in other species, showing only about six folds; outer and basal lips have a slight submarginal porcellaneous subdentate thickening, which stops a little short of the upper termination of the outer lip. There are four colour varieties (though Tryon says the colour pattern is constant):—(a) The short white paired lines may be filled in with white so as to form white spots. (b) Or with a dark buff filling different from the tint of the rest of the shell. (c) The spaces between these spots may be oblique wide broken cream coloured bars. (d) The pairs of white lines immediately below the suture may be twice as numerous as elsewhere.

C. irisodontes Quoy & Gaimard 1834 (*Trochus*) (= *T. irisodon* Philippi; = *T. lactus* Philippi; = *T. schrayeri* Philippi; = *T. circulatus* Philippi; = *Monodonta virgata* Menke; = *T. minor* Tröschel). Pl. 1, fig. 8. "The Rainbow Cantharidus." Imperforate, elongate-conic, pointed, solid, polished; yellowish, pink, or olive-green, with reddish or olive longitudinal lines in pairs, sometimes separate on the last whorl, and usually with numerous narrow, rather obscure spiral pink or yellowish lines; sometimes with a few series of white dots on the upper part. Spire conic, shorter, less attenuated than in *C. bellulus*; whorls about seven, scarcely convex, the last not carinate, finely striate beneath, smooth above; aperture rather large, often expanded, smooth inside, lined with intensely green nacre; columella strongly toothed below. Height 15, diam. 8 mm. Beach, very common,

Gulf St. Vincent to Fremantle; common dredged alive to 10 fathoms, rare from 10 to 24 fathoms. (Type locality—South Australia). Colouration is variable. Some examples are unicoloured green. The aperture is sometimes so dilated that the spire seems to lean to that side. Habitat, on seaweeds.

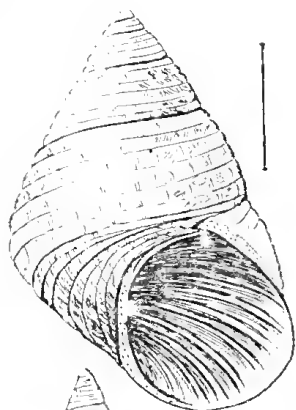
C. nitidulus Philippi 1849 (*Trochus*). "The Brilliant Cantharidus." Turreted-conical, smooth; shining, flesh-coloured, with spiral pale lines articulated with purple; whorls slightly convex, the last two fifths the whole length, obtusely angular; sutures deep; aperture patulous, higher than wide, violaceous inside, iridescent and smooth; columella short, arcuate, terminating in a strong tooth. Height 13, diam. 9 mm. Not common, Gulf St. Vincent, dredged American River (Kangaroo Island) in seaweed, 7-10 fathoms. Also Western Australia—Fremantle, but not typical. (Type locality—unknown. We designate American River, Kangaroo Island). The shell is steeple shaped, smooth and shining, thin; upon a flesh-coloured ground there are, on the upper surface, five whitish and purple-red articulated spiral lines, half as wide as their interspaces; on the base there are nine or ten similar lines; the smooth shining throat gives blue-violet reflections; whorls seven to eight. Closely allied to *C. irisodontes*.

C. conicus Gray 1827 (*Monodonta*) (= *Thalotia picta* A. Adams 1851: = *M. turrita* Menke: = *T. woodsiana* Angas 1872: = *T. troschelii* Philippi: = *Thalotia dubia* Tenison-Woods 1877, a deformed *conicus*). "The Conical Cantharidus." Imperforate, elevated conical, solid; pinkish or grayish white with crimson protoconch and numerous close longitudinal dark reddish-brown stripes, often cut into tessellations by the spiral grooves of the surface; spire straightly conical; apex acute; sutures linear; whorls about seven, nearly planulate, the last obtusely subangular at the periphery; whorls encircled by lirae which are more or less granose, five or six lirae on the early whorls, up to fourteen on the body whorl, and about six on the base; wrinkles of increment more or less prominent; columella straight, denticulate, with prominent tooth at base. Height 18, diam. 13 mm. Beach, very common, all along the South Australian coastline; common dredged alive to 9 fathoms, less common to 15 fathoms. Also Western Australia—Albany, Geraldton. (Type locality—Western Australia). Rather variable in sculpture; the spaces between the spiral ribs often occupied by lirulae. The type of *woodsiana* Angas, is narrower than most examples of *conicus* Gray; the description corresponds exactly.

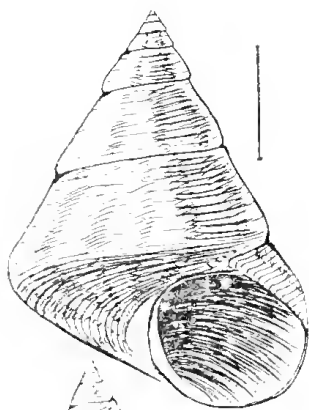
C. neglectus Tate 1893 (*Thalotia*). "The Disregarded Cantharidus." This shell agrees with *C. chlorostoma*, with which it has been confounded, in its arcuate and truncated columella,

PLATE I.

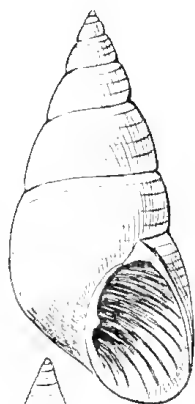
- Fig. 1—*Cantharidus pulcherrimus* Wood.
Fig. 2— „ *lehmanni* Menke.
Fig. 3— „ *eximius* Perry.
Fig. 4— „ *leucostigmus* Menke.
Fig. 5— „ *apicinus* Menke.
Fig. 6— „ *bellulus* Dunker.
Fig. 7—*Leiopyrga octona* Tate.
Fig. 8—*Cantharidella smaltata* Fischer.
Fig. 9—*Cantharidus conicus* Gray.
Fig. 10—*Bankivia fasciata* Menke.
Fig. 11—*Cantharidus neglectus* Tate.
Fig. 12—*Cantharidella beachportensis* sp. nov.



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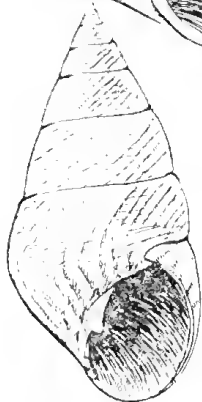
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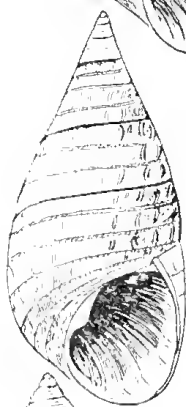
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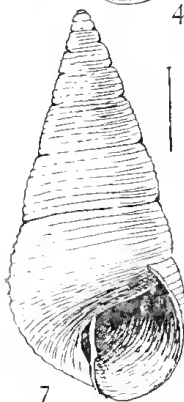
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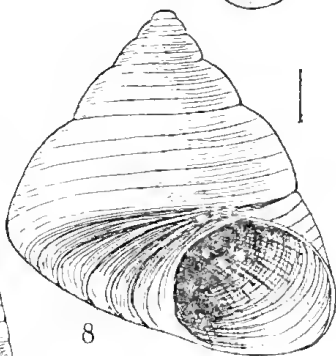
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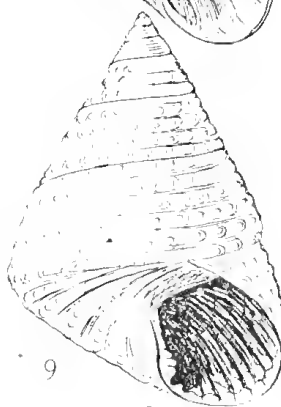
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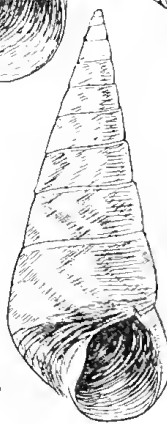
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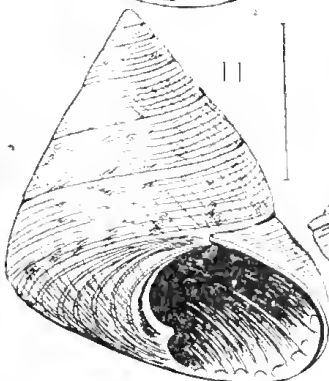
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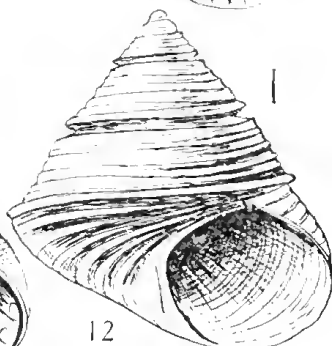
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PLATE II.

Living Fresh-water Mussel *Hydridella australis* attached to foot of Black Duck *Anas superciliosa* (nat. size).

photo: B. COTTON.

A FRESH-WATER MUSSEL ATTACHED TO A DUCK'S FOOT.

By BERNARD C. COTTON.

PLATE II.

An account of a large fresh-water mollusc, *Hyridella australis*, attached to the foot of a common "Black Duck," *Anas superciliosa* appears in the "Advertiser" of July 7, 1934.

The bird was noticed flying near Naracoorte with its foot hanging and was shot. The foot with mussel attached was given to the S.A. Museum and although the mollusc had been out of water four or five days it was still alive and very firmly adhering to the foot by the ventral margins of the shell's two valves; the toe bone of the bird actually being crushed by the pressure.

The mussel is a very fine specimen weighing 2½ ozs., and is the species commonly found in the River Murray and South Australian rivers generally. With this authentic record in mind, it can readily be understood how species of fresh-water Molluscs may become distributed over vast areas.

but is without the acutely carinated periphery; the columella, as in *chlorostoma*, is sharply defined by a coincident umbilical depression. The species differs by the absence of the supra-sutural carina, its slightly convex whorls, and less elevated spire. The eight whorls have the spiral and axial sculpture as in *chlorostoma*; colour usually brown or yellowish, spotted with white or brown-white blotches, and more or less with white and brown above the suture and on the periphery, rarely unicoloured (greenish-yellow). Adult specimens, as shown by the thickened outer lip bevelled to a sharp edge, have been dredged in life on Troubridge Shoal (St. Vincent Gulf) in six fathoms by Matthews. The animal of specimens taken in Gulf St. Vincent may be described as follows:—Foot, light brown, unicoloured underneath; sides speckled with darker brown, the mantle edges white speckled with brown; tentacles long, one half or one third as long as foot, articulated white and reddish brown. Verco took it abundantly, in St. Vincent and Spencer Gulfs in from five to fifteen fathoms. Height 18, diam. 15mm. (Type locality—Gulf St. Vincent). We present Tate's description and remarks, but when a large series is examined the differences become superficial and we regard it as a variant of *C. chlorostoma*. It is found from Yankalilla Bay (South Australia) to Rottnest (Western Australia) and this form is more common than typical *chlorostoma* in South Australia. Not recorded from Victoria or Tasmania in either form.

C. chlorostoma Menke 1843 (*Trochus*). Imperforate, conical, elevated-trochiform, solid; protoconch red; the following whorls reddish-brown, more or less tinged with buff, and in places with olive-green, and sparsely maculate with whitish, the spiral ribs more or less minutely articulated with whitish; whorls eight to nine, flat or slightly concave, acutely carinated, the carina slightly projecting above the sutures; upper surface of each whorl encircled by ten to twelve spiral lirae, only slightly elevated, and with strong regular oblique striae of increment in the interliral interstices; base flat, with about ten concentric narrow lirae, strongly, regularly radiately striate; aperture rhomboidal, very oblique, iridescent and sulcate within; outer and basal lips edged with green, plicate-denticulate within; columella curved, ending in a strong tooth at base, green. Height 24, diam. 20 mm. (Type locality—Western Australia). Corny Point 24 x 23 mm. (Cotton). Gulf St. Vincent and Spencer Gulf, rare. Alive, 9 fathoms, off East Cove, Kangaroo Island (1891). Westward to Esperance, Rottnest and Geraldton, W.A. Peculiar in the elevated straightly conical form, carinated periphery and colouration. There is both a narrow and wide form.

C. blandiana Crosse 1864 (*Thalotia*). "Bland's *Cantharidus*." Elevated conical, imperforate, solid, rather thick; longitudinal striae, rather pronounced, numerous, oblique; spiral lirae, projecting, spotted, and as though articulated with white and a purplish-violet, darker than the rest of the shell, of which the foundation colour is violet-rose; suture not distinct; whorls seven, flat; protoconch of one and a half turns, smooth, shining, purplish-violet with a whitish border; adult whorls striate, with six spiral lirae; last whorl angulated, slightly descending, nearly flat beneath, decussated by spiral cinguli and oblique striae; aperture slightly oblique, subquadrate; interior nacreous and near the lip, wrinkled; umbilical tract slightly concave near the columella; columellar margin arcuate, wrinkled, with one strong fold; basal margin wrinkled; outer lip thickened, granulate within. Height 18.5, diam. 14 mm. (Type locality—Gulf St. Vincent). A tablet in the British Museum is labelled "*Thalotia blandiana* Crosse, S. Aust., C. F. Angas" and on the back "*Thalotia blandiana* J. de Co. XII, 1864, S. Aust. Type, 70, 10, 26, 142." Verco makes the following notes: "This is something like *T. neglecta* Tate but is rather narrow and has six rows of tubercles on the penultimate whorl and slightly curved retrocurrent axial striae, subdistant, one to each tubercle. I have not seen it from South Australia." As Angas suggested (P.Z. Soc., 1865, p.189) this is probably a deep water form. Possibly of *C. neglectus*. A single specimen from St. Francis Island (35 fathoms) conforms fairly well with the original description. A further specimen mounted by Adcock as this species from Salt Creek, Gulf St. Vincent, corresponds except that it has 7 spiral lirae instead of 6 and measures 20 x 15 mm.

C. abnormis Crosse 1864. "The Abnormal *Cantharidus*." Shell imperforate, subelevated conical, thick, rather solid, buffish-tawny, ornamented with spiral series of little beads (white and brown articulated) alternating with obsolete striae; suture little impressed; whorls 6, convexo-plane, the apical 2 whitish, smooth, the following articulate-cingulate, the last slightly descending, subcompressed, obsoletely angular; base slightly convex and like the upper surface in colour; aperture a little oblique, subquadrate, lirae within; columellar margin subarcuate, uniplicate, basal and outer margins thickened, rugose within. Height 15, diam. 10 mm. (Crosse). (Type locality—Gulf St. Vincent, South Australia). Although Adcock and Verco listed this species we have never seen specimens. Verco writes in his MS. notes: "This species has not been recognised by any collectors in South Australia." According to the description it is very closely allied to *Calliostoma zietzi* Verco 1905 and we should be disposed to regard it as probably the beach form of that species.

C. flindersi Fischer 1878. Pl. 1, fig. 9. "Flinder's Cantharidus." Shell very narrowly perforate, conical, rather thick; whorls 7 to 8, planulate, the first eroded, the succeeding whitish-ashen, radiated with narrow, close and flexuose blackish and violaceous lines; spirally cingulate; lirae 6 on the penultimate whorl; last whorl subangular, a little depressed above, dilated in the middle; base convex, ornamented with about 8 lirae; aperture rhomboidal; lip simple; columella arcuate, truncate below. Height 16, diam. 13 mm (Fischer). (Type locality—we designate King George Sound, W.A.). Distinguished from *C. freycineti* Fischer by the less conical form, wider base, stronger spiral ridges, more truncated columellar tooth and different colouration. "Australie meridionale" of Fischer means Southern Australia, not South Australia, King George Sound being the actual type locality. Except for one poor specimen taken by Cotton at Levens, West Yorke Peninsula, there is no other record from South Australia. We have it from Shark Bay and Abrolhos Island, W.A.

C. freycineti Fischer 1878. "Freycinet's Cantharidus." Shell narrowly perforate, conical, rather thick; whorls 7, planulate, the first eroded, buff, the remainder whitish, ornamented with rosy dots and narrow flexuose chestnut flammules; spirally cingulate, about 8 lirae on the penultimate whorl; last whorl carinated; base convex with about 8 concentric lirae; aperture subrhomboidal; lip simple; columella white, obsoletely nodose-truncate below. Height 16, diam. 12 mm. (Fischer). (Type locality—St. Peter and St. Francis Islands, South Australia). This shell is more regularly conical than *C. flindersi* or *C. baudini*. We have not seen specimens of this species. "This species has not been taken by South Australian collectors; but St. Peters Island is off our coast at Denial Bay" (Verco MS.)

C. baudini Fischer 1878. "Baudin's Cantharidus." Shell imperforate, conic-elongate, rather thick; whorls 6 to 7, planulate, the first buff, eroded, the following whitish, ornamented with sparse rosy points and angular chestnut streaks; spirally lirate, lirae about 8 on the penultimate whorl; last whorl subangular depressed above; base convex, with about 8 concentric lirae; aperture rhomboidal; lip simple; columella short, subnodose-truncate below. Height 11, diam. 9 mm (Fischer). (Type locality—King Island, South Australia). Differs from the two preceding species in lacking an umbilical perforation, smaller size, by the depression of the upper part of the whorl and the colouration. "As the shell is not taken in South Australia it should be expunged from our list. The phrase "Australie meridionale" (Fischer) means Southern Australia, not the State of South Aus-

tralia. It was most likely put on the Museum label by Peron about 1805, when he had returned to France, long before this province was created" (Verco MS.)

C. decoratus Philippi 1846. "The Decorated Cantharidus." Shell turreted-conical, imperforate, brownish-ashen; whorls 9, nearly plane, with an elevated cingulus above and below, cut into granules by impressed longitudinal and transverse lines, encircled by three series of granules on a reddish-brown ground, the granules alternately white and black; the interstices have one or two elevated lines. Angle of the last whorl rounded, base rather convex, with about 8 elevated weakly granulated concentric lirae, the granules alternately whitish and dark brown. Columella somewhat oblique, subtruncate at the base, obviously separated from the basal lip by a sinus. Height 20, diam. 15 mm. (Philippi). (Type locality—Port Jackson). Thiele 1930 records the species from Shark Bay, Western Australia and Verco took a typical specimen, fresh, adult, at St. Francis Island, S.A.

Bankivia Beck 1848. Shell tapering, spire sharp, polished, brightly and variedly coloured; whorls smooth flattened, without periostracum; aperture subovate, about one third the length of shell, not nacreous within; columella slightly twisted, subtruncated at base; outer lip simple, sharp. Type—*B. varians* Beck = *Phasianella fasciata* Menke 1830. A monotypic genus restricted to Australia and Tasmania.

B. fasciata Menke 1830 (*Phasianella*) (= *Bankivia varians* Beck 1848: = *B. purpurascea* A. Adams 1851: = *B. major* A. Adams 1851: = *B. nitida* A. Adams 1851: = *B. lugubris* Gould, a colour variety). Pl. I. fig. 10 "The Banded Bankivia." Imperforate, elongated, turreted, thin, polished, shining; white, creamy, or pink, with spiral bands of pink, purplish red, or purplish brown, or narrow oblique zigzag stripes of pinkish brown, usually with a narrow subsutural fascia of dark or pinkish; surface (under lens) very densely, finely spirally striate; base with a few concentric, separated, impressed lines; spire elevated, slender; protoconch dark, small, conical, of two convex small whorls; adult whorls about seven, very slightly convex, a trifle impressed below the sutures; base convex; aperture ovate; outer lip thin, acute; columella sinuous, arcuate above, and narrowly reflexed; obliquely truncate below. Height 19, diam. 8 mm. Very common on sandy shores, from Beachport (South Australia) to Albany (Western Australia); dredged, dead and bleached only, down to 110 fathoms. Also Tasmania, Victoria and New South Wales. (Type locality—South Australia. We designate Largs Bay). Variable in size and colour, black, purple, or with a white band. Largest specimens occur on ocean beaches. On some beaches they are so abundant as to form a pink coloured line

at high tide mark. The type of *B. purpurascea* A. Adams is purple unicoloured; *B. major* A. Adams is the large, open ocean shell.

Leiopyrga H. & A. Adams 1863. Umbilicate, elongated, narrow, somewhat turreted, thin; whorls convex, rounded, or carinated; aperture oval, small; columella arcuate, not truncated at base. Type—*L. picturata* H. & A. Adams 1863 = *lineolaris* Gould 1861. This genus differs from *Bankivia* notably in the possession of an umbilicus. Three recent species occur, *L. lineolaris* Gould, *L. cingulata* Adams, and *L. octona* Tate, all Australian. Fossils recorded are *L. quadricingulata* Tate and *L. sayceana* Tate.

L. lineolaris Gould 1861 (*Cantharidus*) (= *L. picturata* H. & A. Adams 1863). "The Lined Leiopyrga." Narrowly umbilicate, turreted, slender, thin, shining; white, with longitudinal undulating or zigzag, pinkish or purplish lines, often uniting to form spots at the periphery, or prominently angled there; sometimes with spiral bands at the periphery, and around the umbilicus; whorls about seven, convex, more or less carinated at the periphery, carina exerted above the suture, on the spire; base marked by distinct impressed concentric grooves; suture margined; aperture oval; outer lip thin; arcuate, not truncate, and slightly expanded above, but not covering the umbilicus. Height 8-12, diam. 5-7 mm. Gulf St. Vincent. Rare. (Type locality—Port Jackson, N.S.W.) We have not taken it. Adam's type is from Port Jackson, where the species is well known. Angas reported is from Gulf St. Vincent, and Verco records it in M.S. notes as from South Australian waters. Colour variations are much like those of *Bankivia fasciata* Menke:—

1. A plain narrow zone encircles the middle of each whorl.
2. The last whorl without the series of spots at the periphery.
3. A pale band encircles the middle of the last whorl, the lower portion being pinkish or closely spotted with pink.
4. Uniform grayish violet, excepting the upper part of the spire and the umbilical region.

The spiral sulcation and ridging is much more developed in some specimens than others.

L. octona Tate 1891, Pl. 1, fig. 7. "The Eight Circled Leiopyrga." Turreted, narrowly umbilicate, thin, shining; white with oblique or axial zigzag pinkish lines; protoconch of two and a half turns, turbinately depressed, brown, smooth; adult whorls six and a half, moderately convex, separated by a linear suture; first two spire whorls smooth, the third showing faint spiral lines, which increase in strength, with the revolution of the spire; the anterior whorls with about eight to ten equal and equidistant, rounded, and rather depressed cinguli, which are a little wider

than the furrows; body whorl equally and regularly cingulated, base convex; aperture oval; outer lip thin, crenated on the margin; columella thin, but slightly thickened above, and abruptly attenuate to the front, scarcely reflexed; umbilical groove smooth. Height 10, diam. 4.5 mm. Gulf St. Vincent (numerous localities) (South Australia) to Bunbury (Western Australia)—beach—also dredged to 55 fathoms. Type locality—Royston Head, South Yorke Peninsula, South Australia). This species resembles *L. lineolaris* in outline, but differs by its conspicuous cinguli, its convex whorls, and linear suture. Operculum horny, multispiral with five or six revolutions, nucleus central. To the margin of the horny operculum is attached a thin membrane, rather less than one half as wide as the spiral: radially striated in a slightly wavy manner, though absent in the earlier whorls, doubtless worn away; it is ragged on the next to the last whorl. Radula formula $\propto (5.1.5) \propto$. There is a central tooth nearly circular or quadrate, with a central projection in the free edge; then follow five laterals on each side with a thickened outer border, and with the free margin bent over throughout the whole extent; these eleven central denticles have no serrations; then come some short stout uncini, which gradually become longer and narrower and finally are subulate. The number of these marginal denticles, which gradually change their form, is indefinite. Shell very variable. The following forms occur in the South Australian Museum collection:—

1. Sides almost quite straight, but distinctly furrowed at suture and markedly spirally sharply lirate; apex stepped. This is typical.
2. Straight sided, furrowed at suture, no spirals on sides or base.
3. Straight sided, furrowed at suture, spirals on base.
4. Straight sided, no sutural furrow, no spirals.
5. Whorls rounded, no spirals, no sutural furrow.
6. Whorls rounded, no sutural furrow, spirals all over.
7. Straight sided, sutural furrow, marked spirals, oblique axial costae.
8. Straight sided, no sutural furrow, marked spirals, no axials.
9. Protoconch red, elsewhere white, with red axial flames, red around aperture; some specimens from beach, King George Sound.
10. White with faint pink dots; an example from 55 fathoms off Cape Borda.
11. White on upper three whorls, pink in lower three, with a white base; from 55 fathoms off Cape Borda.

Cantharidella Pilsbry 1889. Small forms with much the aspect of tiny *Cantharidus*; usually polished, narrowly or not perforate; conical, elongated. Type—*Gibbula picturata* Adams & Angas 1864.

C. tiberiana Crosse 1863 (*Trochus*). "Tiberi's *Cantharidella*." Imperforate, conical, rather thin; olivaceous with nacreous reflections, with flexuous longitudinal grayish streaks; spire moderately elevated; suture impressed; whorls five and a half to six, subplanate, the last obtusely angulated; base obsoletely striated and covered with spots of grayish-white; aperture oblique, quadrate, inside white, nacreous; columella somewhat expanded; outer margin simple, acute. Height 4.5, diam. 4.5 mm. Not common, beach, MacDonnell Bay, S.E., South Australia. (Type locality—Coodgee Bay, South Australia) (Pilsbry).

C. balteata Philippi 1849 (*Trochus*). "The Girdled *Cantharidella*." Solid, conical, perforate; pale brown a white girdle articulated with vertical black lines encircles the upper whorls at their lower borders and is continued upon the periphery of last whorl; above this girdle are five elevated spiral lirae (punctate with black), and about twelve inconspicuous lirae on the base; whorls six, upper ones flat, body whorl (as high as all the others) bluntly angulated; columella almost vertical, rounded, with a slight tubercle in the middle and forming an angle with the basal lip; base shows oblique streaks formed by the coalescence of black dots. Height 7, diam. 6 mm. Beach, Yankalilla. (Type locality—unknown). From *C. smaltata* Fischer, it is more conical, has flatter whorls, columella vertical (not arcuate), subnodose, forming an angle with the basal lip. The lower whorl joins that above slightly within the edge of the periphery, so as to form a slightly imbricated spire.

C. smaltata Fischer 1879 (*Trochus*). Pl. 1, fig. 8. "The Smalt-*Cantharidella*." Conoid, obtuse, narrowly perforate; shining, colour variable, chestnut or blue, sometimes maculated with green or brown, spirally zoned, the bands linear, narrow, pale, sometimes articulated with brown; protoconch whitish; whorls five, convex, finely obliquely striate; suture linear; penultimate whorl rather tumid, body whorl angulate, subplanate below and obsoletely concentrically lirate; aperture subrotund, sulcate within; basal margin arcuate; columella regularly concave, arcuate, nearly closing the umbilical perforation above; umbilical area somewhat funnel shaped, white, striate, carinate at its margin. Height 6, diam. 6 mm. Yorke Peninsula, Backstairs Passage. Also Western Australia; beach, Hopetoun. (Type locality—South Australia. We designate Spencer Gulf). Differs from *C. tiberiana* Crosse, by the more convex whorls and the rounded

periphery of the body whorl without a projecting ring; appears more inflated and is spirally grooved.

C. beachportensis sp. nov. Pl. 1, fig. 12. "The Beachport Cantharidella." Small, conoid, turbinate, very narrowly perforate in the juvenile, imperforate in the adult; colour pattern distinctive and consistent in holotype and paratypes, but varying somewhat in examples from other South Australian localities, whitish, flecked with small brownish rings at the lower angle of body whorl and near the suture; whorls five, markedly gradate or excavate, tabulate just below the suture producing a channelled-suture appearance, upper angle sharp, lower angle keeled, two or three grooves in between; aperture subrotund; columella regularly concave, a little arcuate, just closing the umbilicus when adult; base subplanulate, grooved. Type, height 4, diam. 3.75 mm. Type locality—40 fathoms off Beachport, South Australia. (Reg. No. D.11287 S. Aus. Mus.) Also 110 fathoms off Beachport (not quite typical): 45 fathoms east of Neptune Islands. Several examples from the type locality but mostly only in fair condition. This deep water species appears most nearly related to *C. smaltata* Fischer, but differs in the peculiar shape of the whorls and coarser sculpture.

NOTICE.

"COMBING THE SOUTHERN SEAS."

Written by the late Sir Joseph Cooke Verco, M.D. (Lond.),
F.R.C.S. (Eng.).

(Edited by Bernard C. Cotton, Conchologist S.A. Museum)

The book (now in press) describes the author's unique adventures in dredging for Marine Specimens in Southern Australian waters. Sir Joseph Verco, 20 years Hon. Conchologist at the S.A. Museum, was the first to undertake extensive scientific investigations of our Southern Australian Seas. There are numerous illustrations and a reprint of the rare, private published "Catalogue of Marine Mollusca of South Australia" 1908, is included. It is hoped the book will appear about November.

The price is 7/6, and orders may be placed with the publishers, Rigby Ltd., 16, Grenfell Street, Adelaide.

PROCEEDINGS.

EVENING MEETING.

APRIL 17th, 1934.

Rev. H. A. Gunter presided over an attendance of about 40 members.

ELECTIONS:

1. Mrs. E. M. Masterman.
2. Mr. C. Boomsma.
3. Miss F. Johns.

The Chairman extended a cordial welcome to the new members.

FLOWER SHOW, 1934.

Word had been received from the Town Clerk that the Town Hall would not be available on October 12 and 13 on account of the visit of Prince Henry occurring on the same dates. It was decided to apply for the Hall on September 14 and 15 on the usual conditions.

PAPER.

Mr. J. M. Black, A.L.S., President of the Royal Society, read a paper on "Botanists and their Work" (see this number). Many appreciative references were made to Mr. Black's paper; those taking part were: Rev. H. A. Gunter, Mr. A. K. Newberry, who mentioned the services of Sir Joseph Banks to Australian botany and the assistance he gave to Richard and Allan Cunningham and George Caley to extend their botanical researches in our continent, Messrs. A. J. Wiley, W. C. Hackett, E. Stansfield and E. H. Ising.

EXHIBITS.

2. By Mr. A. J. Wiley:—Various Australian timbers turned and ducoed among them being *Nealia* (*Acacia* sp.) from Wilcannia; *Acacia Carnei*, from Broken Hill; *Acacia peuce*, about 180 miles from Hermannsburg, C.A.; Gidgee (*Acacia Cambagei*) from near Broken Hill; Minnirichi (*Acacia cyperophylla*), also called red mulga, from Oodnadatta; Myall (probably *Acacia Soredonii*) north of Tarcoola; and Quandong (*Eucarya acuminata*) from Taldra.

3. By Mr. E. H. Ising:—Two new bluebushes named by him in the Trans. Royal Society of S.A. (1933), viz., *Bassia Blackiana* from Oodnadatta and named after Mr. J. M. Black, and *B. Andersonii* from Pedirka, Far North, and named after Mr. R. H. Anderson, of the Sydney Botanic Gardens; a number of highly coloured leaves from New Calendonía collected by Mr. C. Burchell.

MAY, 1933.

HERBARIUM NOTES.

A parcel of 61 specimens was received from Mr. C. V. Hoile, Peterborough, collected around that town last spring. The following are those of greatest interest:—*Acacia argyrophylla* Hook.; *Zygophyllum Billardieri* D.C.; *Teucrium sessiliflorum* Benth; *Leptorrhynchus tetrachaetus* (Schlecht.) J. M. Black; *Helipterum Jessenii* F.v.M. The first named above is only known from north of Kapunda, Peterborough and the Far North, besides West Australia.

OUR EXCHANGES.

1. "The Victorian Naturalist" to July, 1934. The July number contains illustrated articles on the Kaolo.
 2. "The Australian Museum Magazine," June number.
 3. "The N. Queensland Naturalist" for June, 1934.
 4. Linnean Society of N.S.W. Abstract of proceedings for May, 1934.
 5. "Natural History". Journal of the American Museum of Natural History, N.Y. June, 1934.
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WILD FLOWER SHOW.

This Year the Show is to be held in the

STOW CHURCH HALL

FLINDERS STREET.

on October 12th and 13th.

Members are invited to make this known.

ROYAL SOCIETY OF S.A. INCORPORATED — FIELD NATURALISTS' SECTION.

Statement of Receipts and Expenditure for year ended July 31st, 1934.

RECEIPTS.		EXPENDITURE.	
July 31st, 1934.		July 31st, 1934.	
Bank Balance, 1/8/33	27 3 6	By Printing and Engraving	61 7 10
Cash in hand, 1/8/33	8 2	" Postages, etc.	9 13 0
Subscriptions	41 1 3	" Public Library	5 1 2
Other Receipts—		" Librarians and Stationery	7 0 10
Donation for Magazine	3 12 6	" Advertising	19 6
Sale of Magazines	19 2	" Hire of Rooms	1 10 0
Balance Wild Flower Show	19 15 8	" Jubilee Expenses	6 9 0
Refund of advance for Flower Show	5 0 0	" Advance for Wild Flower Show	5 0 0
Entomological Society	10 0	" Lantern	7 6
Receipts from Jubilee Social	5 19 0	" Bank Balance	97 8 10
Refund from Publishers	3 3		7 17 8
Interest	14 0		
	36 13 7		
	£105 6 6		£105 6 6

(Sgd.) BERNARD C. COTTON, Hon. Treasurer.

Audited and found correct.

WALTER D. REED, F.C.A. (Aust.)
BEAVIS B. BECK

Auditors.

ADELAIDE: 3rd August, 1934.

**FIELD NATURALISTS' SECTION OF THE
ROYAL SOCIETY**

Publications of the Section.

No. 1.—“The National Parks of Australia,” by Wm. H. Selway. (Out of print).

PUBLICATION NO. 2

**GEOLOGICAL AND BOTANICAL NOTES
on the
VICTOR HARBOUR DISTRICT
by**

**PROF. J. B. CLELAND, M.D., and
PROF. WALTER HOWCHIN, F.G.S.**

Published by Cole's Book Arcade,

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